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EFFECT OF PACLOBUTRAZOL AND CHEMICALS ON MORPHOLOGICAL CHARACTERISTICS IN MANGO CV. KESAR

P.A. Sasane[1*], G. M. Waghmare[2], R.V. Nainwad[3], B.M. Kalalbandi[4], H.V. Kalpande[5], S.S. More[6] and P. Akhilasrinidhi[1]

[1]Department of Horticulture, College of Agriculture Parbhani, VNMKV, Parbhani, Maharashtra, India
[2]Ex. Director of Extension Education, VNMKV, Parbhani, Maharashtra, India
[3]Fruit Research Station, Chatrapati Sambhajinagar Maharashtra, India
[4]College of Horticulture VNMKV, Parbhani Maharashtra, India
[5]Department of Agricultural Botany, VNMKV Parbhani Maharashtra, India
[6]Department of Agricultural Economics VNMKV, Parbhani Maharashtra, India
*Corresponding author E-mail: pratikshasasane55@gmail.com

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ABSTRACT

The present experiment was conducted at the Fruit Research Station, located in Himayat bagh, Sambhaji Nagar (MH), during the period of 2023-2024 and 2024-25. The experiment followed the Factorial Randomized Block Design (FRBD) methodology, with two replications of each of the twenty-seven treatments and plant dimensions of 5.0 m x 4.0 m. effect of paclobutrazol and different chemical treatments was tested on plant height, plant spread (E–W and N–S), number of auxiliary buds/twigs, and number of panicles during 2023–24 and 2024–25. Observations recorded before and after application revealed that paclobutrazol treatments did not cause a statistically significant reduction in plant height or plant spread in either direction; however, they effectively controlled excessive vegetative growth. Chemical treatments and their interaction with paclobutrazol also showed non-significant effects on plant height and plant spread in both years and in pooled analysis. The number of auxiliary buds/twigs was not significantly influenced by paclobutrazol dose, but chemical treatments significantly affected bud production. Number of auxiliary buds was not significantly affected by the Paclobutrazol dose in both the year. Number of auxiliary buds was significantly affected by chemical treatments in 2024, Chemical dose C_9 (KNO_3 4%) gave highest auxiliary bud (5.17,5.00,5.08) in year 2023-24, year 2024-25 and pooled mean estimation. affected by interaction effect between paclobutrazol dose and chemical treatments. Treatment combination of paclobutrazol dose and chemical dose P_2C_9 (pp^{333} 3 ml + KNO_3 4%) gave highest (6.50,6.00,6.25 buds) number of auxiliary buds in year 2023-24 in year 2024-25 and pooled mean estimation. Number of panicles per tree was significantly influenced by paclobutrazol treatment, highest number of panicles per tree was obtained by paclobutrazol dose P_3 (pp^{333} 4ml) 298.67 in 2023, in 2024 same treatment gave 310.42 panicles and pooled mean estimation was obtained 304.54 for same treatment. Number of panicles per tree was significantly influenced by chemical treatment, Chemical dose C_9 (KNO_3 4 %) gave highest number of panicles Per tree (365.50, 382.42, 373.96) for both year as well as pooled mean estimation. Treatment combination of paclobutrazol dose and chemical dose P_2C_9 (pp^{333} 3 ml + KNO_3 4%) gave highest number of panicles (384.50, 407.50 396) for both years as well as pooled mean estimation.

***Keywords* :** Vegetative Growth, Paclobutrazol, KNO_3, Growth Regulation.

Introduction

Mango *(Mangifera indica* L.) is universally admired as one of the most valuable and desirable fruits and is popularly acclaimed as the “King of Fruits”. The crop originated in the South-East Asian region and has been cultivated in the Indian subcontinent since ancient times. Mango holds a prominent position in Indian horticulture and culture and has been declared the

National Fruit of India. The mango tree is evergreen plant with symmetrical shape in sufficiently open space. The tree has a long straight bowl and is sympodially branched.

The tree is erect and fast growing in summer with broad and rounded, or more upright canopy and a relatively slender crown. Considerable variation in canopy characteristics of Indian mango cultivars has been observed. Mango trees grow to 10–40 m height, with a crown radius of 10 m. Seedling trees live much more than 100 years whereas grafted ones live only 80 years or less. Seedling tree measuring a spread of 125 ft. and a girth of 25 ft, grafted trees are dwarf (6-9 m) with spreading branches.

To regulate flowering and enhance productivity, several plant growth regulators and chemical substances have been evaluated at different stages of mango growth. Several chemicals possessing growth-regulating properties have been tested for their ability to promote or suppress flowering under varied agro-climatic conditions (Chacko, 1991). Earlier studies have demonstrated that the combined application of paclobutrazol with chemical sprays such as KNO_3, KH_2PO_4, K_2HPO_4, H_3PO_4 and thiourea can effectively induce early and uniform flowering in mango.

Paclobutrazol (PBZ) has been extensively studied for its role in suppressing excessive vegetative growth and promoting flowering in mango through inhibition of gibberellin biosynthesis, leading to improved assimilation partitioning toward reproductive development. Soil drenching with PBZ induces precocious flowering in young trees and advances flowering in bearing trees (Kulkarni, 1988). PBZ significantly reduces the number of days required for panicle emergence, with higher concentrations proving more effective, a response closely associated with enhanced carbohydrate reserves that favor flower bud differentiation.

Apart from paclobutrazol, chemicals such as potassium nitrate (KNO_3) have also been found to influence flowering and fruiting behavior. Potassium nitrate, containing 14% nitrogen and 46% potassium, plays a vital role in chlorophyll formation, photosynthesis, sugar translocation and starch synthesis. KNO_3 has been reported to induce flowering in mango by enhancing nitrate reductase activity and stimulating ethylene production. Its use for flower induction has been reported in mango-growing regions such as Mexico, Hawaii (USA) and Malaysia (Nulit *et al*., 2014).

The application of these substances during the pre-flowering phase has proven beneficial in fostering flower bud development and increasing the proportion of hermaphrodite flowers, ultimately resulting in improved fruit setting and retention. Rajkumar *et al*. (2007) and Krishna *et al*. (2020) found that KH_2PO_4 at a concentration of 1.0 % and H_3PO_4 at 0.5 % were particularly effective in promoting early flowering, enhancing flowering intensity, and improving panicle characteristics.

Considering the commercial importance and problems of mango cv. Kesar and the role of various chemicals in it, the prevailing study was conducted in agro-climatic conditions of the Marathwada region.

Materials and Methods

The present experiment was conducted at the Fruit Research Station, located in Himayat bagh, Chatrapati Sambhaji Nagar (MH), during the period of 2023-2024 and 2024-25. The experiment followed the Factorial Randomized Block Design (FRBD) methodology, with two replications of each of the twenty-seven treatments and plant dimensions of 5.0 m x 4.0 m and two factors, factor A Paclobutrazol dose consist of 3 levels of paclobutrazol pp333 2 ml, pp333 3 ml, pp333 4 ml applied at canopy diameter. Factor B chemical treatment consists of 9 levels of chemicals, Thiourea 1 g, Thiourea 0.5 g, Thiourea 0.25 g, KH_2PO_4 1 g, KH_2PO_4 1.5 g, KH_2PO_4 2 g, KNO_3 2%, KNO_3 3%, KNO_3 4% Application of paclobutrazol dose was done by soil drenching method. The best way to ensure that the paclobutrazol is properly absorbed by the tree is to apply it to the soil into 15 small holes having 6-inch-deep depth around the fertilizer ring. The solution was made with calculated amount of paclobutrazol (2 ml, 3 ml and 4 ml) by dissolving in 1.5 liters of water around 100 ml solution applied in each hole. The tree's height was measured using a measuring tape from the point of primary branching on the main trunk to its base above the ground level. A straight bamboo pole was used for support during the measurement. measured two times, i.e., before application of paclobutrazol and chemicals and after application of paclobutrazol and chemicals. Plant spread was measured two times, i.e., before application of paclobutrazol and chemicals and after application of paclobutrazol and chemicals by using a measuring tape in East-West and North -South direction of selected trees. Four shoots from each direction were tagged randomly. The number of axillary buds from four directions were recorded and the average value was determined. The number of panicles per tree were counted from each direction and then mean was calculated for sample trees.

Results and Discussion

Vegetative growth parameters

Plant height before application of paclobutrazol and chemicals

Table-1 displays the plant height before application of paclobutrazol and chemicals on it.

Plant height (m) after application of paclobutrazol and chemicals

Table 2 displays Plant height (m) after application of paclobutrazol and chemicals. The data revealed that all the paclobutrazol treatment showed no significant effect on plant height in both the year, but it controlled the excessive growth of plants. Paclobutrazol is a plant growth regulator that inhibits the synthesis of gibberellin hormones responsible for cell elongation and overall plant height. Higher doses of paclobutrazol more effectively suppress gibberellin production, resulting in reduced cell elongation and, consequently, shorter plant stature.

Similar results were recorded by Kulkarni (1988) and Singh (2017) in Deshehari mango, Petkule *et al.* (2024).

Chemical dose was found to be non-significant for plant height (m) in year 2023-24 in year 2024-25 and pooled mean.

Interaction effect paclobutrazol dose and chemical showed no significant effect on plant height in both the year.

Plant spread E-W Before application of paclobutrazol and chemicals

Table 3 display Plant spread E-W Before application of paclobutrazol and chemicals. Plant spread E-W (m) was measured before application of paclobutrazol and chemicals to study the effect of application of paclobutrazol and chemicals on it.

Plant spread E-W After application of paclobutrazol and chemicals

Table 4 displays plant spread E-W After application of paclobutrazol and chemicals. The data revealed that all the paclobutrazol treatment showed no significant effect on plant spread E-W but it controls the excessive increase in plant spread E-W (m).

Paclobutrazol, a plant growth regulator, markedly influences plant spread through the inhibition of gibberellin biosynthesis. This suppression limits stem elongation and reduces overall plant size, leading to a compact and bushy growth habit characterized by shorter, denser shoots. By restricting vertical growth while encouraging lateral development, paclobutrazol effectively regulates plant spread and overall canopy dimensions. This finding has similarity with Petkule *et al.* (2024 Chemical dose showed no significant effect on plant spread E-W (m) in both the year. Interaction effect of paclobutrazol dose and chemical dose in both the year showed no significant effect on plant spread E-W (m).

Plant spread N-S (m) was measured before application of paclobutrazol and chemicals

Table 5 showed Plant spread N-S (m) was measured before application of paclobutrazol and chemicals to study the effect of application of paclobutrazol and chemicals on it.

Plant spread N-S After application of paclobutrazol and chemicals

Table 6 showed Plant spread N-S After application of paclobutrazol and chemicals. Plant spread N-S (m) After application of chemicals does not significantly affect by the application of paclobutrazol in year 2023-24 and in year 2024-25. But it successfully controls the excessive plant spread of plant in N-S (m). Paclobutrazol, a plant growth regulator, markedly influences plant spread through the inhibition of gibberellin biosynthesis. This suppression limits stem elongation and reduces overall plant size, leading to a compact and bushy growth habit characterized by shorter, denser shoots. By restricting vertical growth while encouraging lateral development, paclobutrazol effectively regulates plant spread and overall canopy dimensions. This finding has similarity with Petkule *et al* (2024).

Plant spread N-S (m) After application of chemicals does not significantly affect by the application of chemicals in year 2023-24 and in year 2024-25. Interaction effect paclobutrazol dose and chemical does not significantly affect Plant spread N-S (m) in year 2023-24 and in year 2024-25.

Effect of paclobutrazol, chemicals and interaction effect on Number of auxiliary bud/ twigs

Table 7 showed Effect of paclobutrazol, chemical and interaction effect on number of auxiliary bud/ twigs. Number of auxiliary buds was not significantly affected by the Paclobutrazol dose in both the year. Number of auxiliary buds was significantly affected by chemical treatments in 2024, Chemical dose C_9 (KNO_3 4%) gave highest auxiliary bud (5.17,5.00,5.08) in year 2023-24, year 2024-25 and pooled mean estimation. Number of auxiliary buds was significantly affected by interaction effect between paclobutrazol dose and chemical treatments. Treatment combination of paclobutrazol dose and chemical dose P_2C_9 (pp[333] 3 ml + KNO_3 4%) gave highest (6.50,6.00,6.25 buds) number of auxiliary buds in year 2023-24 in year 2024-25 and pooled mean estimation.

Earlier studies indicated that KNO_3 acts as a stimulus for flower initiation by sensitizing the buds to floral signals rather than directly inducing flowering. It was reported that the floral stimulus already existed in the shoots at the time the buds responded to KNO_3 application (Kulkarni, 1988).

Variation in number of axillary buds due to different doses of paclobutrazol might be attributed to its influence on apical dominance and overall growth behavior of the plant. Paclobutrazol at low to moderate concentrations suppresses gibberellin biosynthesis, which reduces apical dominance and encourages the emergence of axillary buds, resulting in enhanced branching and development of a compact canopy.

At higher concentrations, stronger inhibition of vegetative growth may excessively restrict shoot elongation, leading to very compact plants with comparatively higher number of axillary buds. Similar increase in axillary bud formation following paclobutrazol application was also reported by Singh (2000) in Dashehari mango and by Petkule *et al.* (2024)

Number of panicles per tree

Table 8 showed Effect of paclobutrazol, chemical and interaction effect on number of panicle per tree.

The data revealed that highest number of panicles per tree was obtained by paclobutrazol dose P_3 (pp333 4ml) 298.67 in 2023 in 2024 same treatment gave 310.42 panicles followed by P_2 (295.22), and pooled mean estimation was obtained 304.54 for same treatment.

Lowest number of panicles (200.78, 206.06. 203.42) per tree was obtained by paclobutrazol treatment P_1 (pp333 2ml) for year for both year as well as pooled mean estimation.

Chemical dose C_9 (KNO_3 4 %) gave highest number of panicles Per tree (365.50, 382.42, 373.96) for both year as well as pooled mean estimation.

Lowest number of panicles Per tree was given by Chemical dose C_2 Thiourea 0.5 g (KNO_3 4 %) (176, 189.83, 182.92) for both year as well as pooled mean estimation.

Interaction between paclobutrazol dose and chemical treatments significantly affected the number of panicles per tree.

The data revealed that Treatment combination of paclobutrazol dose and chemical dose P_2C_9 (pp333 3 ml + KNO_3 4%) gave highest number of panicles 384.50 in year 2023-24

In year 2024-25 treatment combination P_2C_9 (pp333 3 ml + KNO_3 4%) gave 407.50.

And pooled mean estimation 396 was given by treatment combination P_2C_9 (pp333 3 ml + KNO_3 4%).

The increase in number of panicles might be attributed to the physiological action of KNO_3, which involves biochemical reduction of nitrate into ammonia. The ammonia thus formed enters nitrogen metabolism of the tree and participates in synthesis of amino acids, particularly methionine. Methionine is further converted into S-adenosyl methionine (SAM), which leads to formation of 1-aminocyclopropane-1-carboxylic acid (ACC) and finally to ethylene. Ethylene acts as an important secondary messenger in plant developmental processes and may play a significant role in stimulating flowering and enhancing panicle production per tree.

The higher proportion of flowering shoots could also be due to reduced utilization of tree reserves for vegetative growth, thereby minimizing assimilation limitation and favoring reproductive development. Paclobutrazol has been reported to increase total phenolic content in terminal buds and to alter the phloem to xylem ratio of the stem, which helps in suppressing vegetative growth and promoting flowering through modified assimilate partitioning and improved nutrient supply towards reproductive sinks. Enhancement in number of flowering shoots following paclobutrazol application ultimately contributed to greater panicle production per tree. Hence, the combined use of KNO_3 and paclobutrazol resulted in a marked increase in panicle number. These findings agree with the reports of Amarcholi *et al.* (2016), Dheeraj *et al.* (2016), Sarker *et al.* (2016) and Solanki *et al.* (2021) in mango.

Table 1: Plant height(m) Before application of paclobutrazol and chemicals

Treatments	Plant Height (m)		
	2023	2024	Pooled mean
Factor A (Paclobutrazol)			
P1	4.58	4.76	4.67
P2	4.78	4.98	4.88
P3	4.89	5.09	4.99
S.Em	0.22	0.23	0.23
C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	4.85	5.07	4.96

C2	4.76	4.90	4.83
C3	4.75	4.97	4.86
C4	4.56	4.71	4.63
C5	4.73	4.93	4.83
C6	4.75	4.96	4.86
C7	4.78	4.96	4.87
C8	4.79	4.98	4.88
C9	4.80	5.00	4.90
S.Em	0.38	0.40	0.39
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	4.85	5.04	4.95
P1C2	4.67	4.80	4.73
P1C3	4.67	4.89	4.78
P1C4	4.18	4.34	4.26
P1C5	4.35	4.53	4.44
P1C6	4.38	4.62	4.50
P1C7	4.90	5.07	4.98
P1C8	4.80	4.99	4.89
P1C9	4.45	4.61	4.53
P2C1	4.64	4.85	4.74
P2C2	4.77	4.95	4.86
P2C3	4.84	5.07	4.95
P2C4	4.71	4.86	4.79
P2C5	4.69	4.89	4.79
P2C6	4.99	5.16	5.08
P2C7	4.61	4.80	4.70
P2C8	4.74	4.92	4.83
P2C9	5.04	5.30	5.17
P3C1	5.05	5.31	5.18
P3C2	4.84	4.97	4.90
P3C3	4.76	4.95	4.85
P3C4	4.79	4.93	4.86
P3C5	5.15	5.38	5.26
P3C6	4.90	5.10	5.00
P3C7	4.83	5.02	4.92
P3C8	4.84	5.03	4.93
P3C9	4.91	5.11	5.01
S.Em	0.67	0.70	0.68
C.D. at 5%	N/A	N/A	N/A

Table 2 : Plant height(m) after application of paclobutrazol and chemicals

Treatments	**Plant Height (m)**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	4.60	4.78	4.69
P2	4.80	5.00	4.90
P3	4.92	5.11	5.02
S.Em	0.24	0.25	0.25
C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	4.87	5.09	4.98
C2	4.78	4.92	4.85
C3	4.78	4.99	4.88
C4	4.58	4.73	4.65
C5	4.75	4.95	4.85
C6	4.78	4.98	4.88
C7	4.80	4.98	4.89
C8	4.82	5.00	4.91
C9	4.82	5.02	4.92
S.Em	0.41	0.44	0.43
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	4.87	5.06	4.96
P1C2	4.69	4.81	4.75
P1C3	4.70	4.91	4.80
P1C4	4.20	4.35	4.27
P1C5	4.37	4.55	4.46
P1C6	4.41	4.64	4.52
P1C7	4.92	5.09	5.00
P1C8	4.83	5.01	4.92
P1C9	4.46	4.61	4.54
P2C1	4.66	4.87	4.77
P2C2	4.80	4.97	4.88
P2C3	4.86	5.09	4.97
P2C4	4.73	4.88	4.81
P2C5	4.72	4.92	4.82
P2C6	5.02	5.18	5.10
P2C7	4.63	4.81	4.72
P2C8	4.77	4.95	4.86
P2C9	5.08	5.33	5.20
P3C1	5.09	5.33	5.21
P3C2	4.86	4.99	4.93
P3C3	4.79	4.98	4.88
P3C4	4.81	4.96	4.88
P3C5	5.18	5.40	5.29
P3C6	4.92	5.13	5.02
P3C7	4.85	5.04	4.95
P3C8	4.87	5.05	4.96
P3C9	4.94	5.13	5.03
S.Em	0.72	0.76	0.74
C.D. at 5%	N/A	N/A	N/A

Table 3 : Plant spread E-W Before application of paclobutrazol and chemicals

Treatments	**Plant Spread E-W (M)**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	4.94	5.07	5.01
P2	5.21	5.25	5.23
P3	5.27	5.43	5.36
S.Em	0.26	0.26	0.26

C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	5.37	5.43	5.40
C2	5.06	5.16	5.11
C3	5.02	5.22	5.12
C4	4.80	4.90	4.85
C5	5.17	5.25	5.21
C6	5.28	5.39	5.34
C7	5.13	5.28	5.21
C8	5.11	5.22	5.17
C9	5.33	5.40	5.37
S.Em	0.46	0.46	0.46
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	5.28	5.39	5.33
P1C2	5.04	5.12	5.08
P1C3	5.01	5.11	5.06
P1C4	4.29	4.55	4.42
P1C5	4.83	4.86	4.84
P1C6	4.90	5.01	4.95
P1C7	5.34	5.59	5.46
P1C8	5.05	5.14	5.10
P1C9	4.74	4.89	4.82
P2C1	5.06	5.03	5.04
P2C2	5.13	5.14	5.14
P2C3	5.16	5.29	5.23
P2C4	5.03	5.06	5.05
P2C5	5.05	5.11	5.08
P2C6	5.60	5.67	5.64
P2C7	4.88	4.92	4.90
P2C8	5.15	5.21	5.18
P2C9	5.83	5.80	5.81
P3C1	5.78	5.88	5.83
P3C2	5.03	5.23	5.13
P3C3	4.90	5.28	5.09
P3C4	5.07	5.10	5.09
P3C5	5.62	5.78	5.70
P3C6	5.35	5.49	5.42
P3C7	5.18	5.34	5.26
P3C8	5.14	5.30	5.22
P3C9	5.43	5.51	5.47
S.Em	0.79	0.79	0.79
C.D. at 5%	N/A	N/A	N/A

Table 4 : Plant spread E-W After application of paclobutrazol and chemicals

Treatments	**Plant Spread E-W (M)**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	5.02	5.07	5.04
P2	5.25	5.29	5.27
P3	5.39	5.47	5.44
S.Em	0.26	0.27	0.26

C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	5.42	5.48	5.45
C2	5.13	5.20	5.16
C3	5.19	5.25	5.22
C4	4.88	4.93	4.91
C5	5.23	5.28	5.26
C6	5.36	5.41	5.38
C7	5.20	5.25	5.23
C8	5.18	5.24	5.21
C9	5.39	5.47	5.43
S.Em	0.46	0.46	0.45
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	5.38	5.43	5.40
P1C2	5.10	5.15	5.13
P1C3	5.06	5.12	5.09
P1C4	4.54	4.59	4.56
P1C5	4.85	4.90	4.88
P1C6	4.95	5.00	4.98
P1C7	5.39	5.46	5.43
P1C8	5.07	5.13	5.10
P1C9	4.83	4.84	4.83
P2C1	5.05	5.09	5.07
P2C2	5.15	5.20	5.18
P2C3	5.27	5.34	5.30
P2C4	5.03	5.08	5.06
P2C5	5.10	5.14	5.12
P2C6	5.65	5.70	5.68
P2C7	4.90	4.93	4.92
P2C8	5.20	5.23	5.22
P2C9	5.88	5.93	5.90
P3C1	5.83	5.93	5.88
P3C2	5.13	5.25	5.19
P3C3	5.24	5.30	5.27
P3C4	5.08	5.12	5.10
P3C5	5.75	5.79	5.77
P3C6	5.47	5.53	5.50
P3C7	5.32	5.36	5.34
P3C8	5.27	5.35	5.31
P3C9	5.48	5.64	5.56
S.Em	0.79	0.80	0.78
C.D. at 5%	N/A	N/A	N/A

Table 5 : Plant spread N-S Before application of paclobutrazol and chemicals

Treatments	**Plant Spread N-S (m)**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	4.46	4.53	4.50
P2	4.51	4.70	4.61
P3	4.55	4.66	4.61
S.Em	0.23	0.24	0.23

C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	4.67	4.81	4.74
C2	4.55	4.67	4.61
C3	4.55	4.66	4.61
C4	4.24	4.37	4.30
C5	4.48	4.62	4.55
C6	4.55	4.68	4.61
C7	4.50	4.61	4.56
C8	4.51	4.63	4.57
C9	4.53	4.65	4.59
S.Em	0.39	0.42	0.40
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	4.84	4.91	4.87
P1C2	4.73	4.75	4.74
P1C3	4.66	4.73	4.70
P1C4	4.01	4.05	4.03
P1C5	4.17	4.27	4.22
P1C6	4.24	4.28	4.26
P1C7	4.69	4.85	4.77
P1C8	4.61	4.67	4.64
P1C9	4.20	4.29	4.25
P2C1	4.32	4.53	4.42
P2C2	4.45	4.65	4.55
P2C3	4.64	4.78	4.71
P2C4	4.30	4.58	4.44
P2C5	4.45	4.64	4.55
P2C6	4.80	5.05	4.93
P2C7	4.35	4.48	4.41
P2C8	4.48	4.67	4.57
P2C9	4.84	4.99	4.91
P3C1	4.85	5.00	4.93
P3C2	4.49	4.60	4.55
P3C3	4.37	4.49	4.43
P3C4	4.40	4.48	4.44
P3C5	4.81	4.97	4.89
P3C6	4.60	4.71	4.66
P3C7	4.47	4.51	4.49
P3C8	4.44	4.55	4.50
P3C9	4.55	4.67	4.61
S.Em	0.68	0.72	0.69
C.D. at 5%	N/A	N/A	N/A

Table 6 : Plant spread N-S After application of paclobutrazol and chemicals

Treatments	**Plant Spread N-S**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	4.49	4.57	4.53
P2	4.61	4.70	4.66
P3	4.58	4.71	4.64
S.Em	0.22	0.22	0.22
C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	4.74	4.88	4.81
C2	4.58	4.69	4.64
C3	4.59	4.71	4.65
C4	4.33	4.39	4.36
C5	4.54	4.64	4.59
C6	4.56	4.69	4.63
C7	4.57	4.61	4.59
C8	4.54	4.65	4.59
C9	4.57	4.68	4.63
S.Em	0.39	0.39	0.38
C.D. at 5%	N/A	N/A	N/A
Interaction			
P1C1	4.87	4.99	4.93
P1C2	4.74	4.78	4.76
P1C3	4.66	4.77	4.72
P1C4	4.03	4.11	4.07
P1C5	4.20	4.29	4.25
P1C6	4.21	4.31	4.26
P1C7	4.81	4.86	4.84
P1C8	4.64	4.74	4.69
P1C9	4.23	4.31	4.27
P2C1	4.45	4.59	4.52
P2C2	4.58	4.60	4.59
P2C3	4.67	4.86	4.76
P2C4	4.53	4.55	4.54
P2C5	4.55	4.63	4.59
P2C6	4.88	5.05	4.96
P2C7	4.42	4.37	4.40
P2C8	4.52	4.63	4.58
P2C9	4.92	5.04	4.98
P3C1	4.89	5.06	4.98
P3C2	4.44	4.68	4.56
P3C3	4.46	4.52	4.49
P3C4	4.43	4.51	4.47
P3C5	4.87	5.01	4.94
P3C6	4.60	4.73	4.67
P3C7	4.49	4.60	4.55
P3C8	4.45	4.58	4.52
P3C9	4.58	4.69	4.63
S.Em	0.67	0.67	0.66
C.D. at 5%	N/A	N/A	N/A

Table 7 : Effect of paclobutrazol and chemical on Number of auxiliary bud/ twigs

Treatments	**Number of Auxiliary Buds/ Twig**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P1	4.50	4.56	4.53

P2	4.28	4.11	4.19
P3	4.22	4.56	4.39
S.Em	0.20	0.15	0.13
C.D. at 5%	N/A	N/A	N/A
Factor B (Chemical)			
C1	3.83	4.00	3.92
C2	3.83	3.83	3.83
C3	3.67	4.33	4.00
C4	4.83	5.17	5.00
C5	4.33	4.50	4.42
C6	4.17	4.83	4.50
C7	4.83	4.00	4.42
C8	4.33	4.00	4.17
C9	5.17	5.00	5.08
S.Em	0.34	0.27	0.22
C.D. at 5%	0.99	0.78	0.64
Interaction			
P1C1	3.50	4.50	4.00
P1C2	4.00	4.50	4.25
P1C3	4.50	5.00	4.75
P1C4	4.50	5.00	4.75
P1C5	5.50	5.00	5.25
P1C6	3.50	4.00	3.75
P1C7	5.50	4.50	5.00
P1C8	5.00	4.50	4.75
P1C9	4.50	4.00	4.25
P2C1	2.50	3.00	2.75
P2C2	4.50	2.50	3.50
P2C3	3.00	3.50	3.25
P2C4	5.00	5.00	5.00
P2C5	4.00	4.50	4.25
P2C6	4.50	5.00	4.75
P2C7	5.00	3.50	4.25
P2C8	3.50	4.00	3.75
P2C9	6.50	6.00	6.25
P3C1	5.50	4.50	5.00
P3C2	3.00	4.50	3.75
P3C3	3.50	4.50	4.00
P3C4	5.00	5.50	5.25
P3C5	3.50	4.00	3.75
P3C6	4.50	5.50	5.00
P3C7	4.00	4.00	4.00
P3C8	4.50	3.50	4.00
P3C9	4.50	5.00	4.75
S.Em	0.59	0.46	0.38
C.D. at 5%	1.71	1.34	1.11

Table 8 : Effect of paclobutrazol and chemicals on Number of panicles per tree

Treatments	**Number of panicles per tree**		
	2023	**2024**	**Pooled mean**
Factor A (Paclobutrazol)			
P_1	200.78	206.06	203.42
P_2	283.17	295.22	289.20
P_3	298.67	310.42	304.54
S.Em	4.36	4.62	3.52
C.D. at 5%	12.75	13.50	10.28
Factor B (Chemical)			
C_1	241.67	239.00	240.33
C_2	176.00	189.83	182.92
C_3	264.33	266.83	265.58
C_4	219.67	221.67	220.67
C_5	328.33	347.33	337.83
C_6	234.83	237.00	235.92
C_7	252.00	266.83	259.42
C_8	265.50	284.17	274.83
C_9	365.50	382.42	373.96
S.Em	7.56	8.00	6.09
C.D. at 5%	22.09	23.38	17.80
Interaction			
P_1C_1	122.50	125.00	123.75
P_1C_2	205.00	217.50	211.25
P_1C_3	105.50	90.00	97.75
P_1C_4	192.00	201.50	196.75
P_1C_5	284.50	290.00	287.25
P_1C_6	133.50	126.00	129.75
P_1C_7	225.00	240.50	232.75
P_1C_8	201.00	215.00	208.00
P_1C_9	338.00	349.00	343.50
P_2C_1	305.00	317.00	311.00
P_2C_2	110.00	122.00	116.00
P_2C_3	325.00	340.50	332.75
P_2C_4	292.00	273.00	282.50
P_2C_5	364.00	370.00	367.00
P_2C_6	207.00	235.00	221.00
P_2C_7	261.00	273.00	267.00
P_2C_8	300.00	319.00	309.50
P_2C_9	384.50	407.50	396.00
P_3C_1	297.50	275.00	286.25
P_3C_2	213.00	230.00	221.50
P_3C_3	362.50	370.00	366.25
P_3C_4	175.00	190.50	182.75
P_3C_5	336.50	382.00	359.25
P3C6	364.00	350.00	357.00
P3C7	270.00	287.00	278.50
P3C8	295.50	318.50	307.00
P3C9	374.00	390.75	382.38
S.Em	13.09	13.86	10.55
C.D. at 5%	38.26	40.50	30.83

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