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Response of off-season strawberries (*Fragaria sp.*) production under the effects of paclobutrazol and drought stress

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Abstract

Strawberry (*Fragaria* sp.) is a fruit crop harvested seasonally with the peak season from August to November while the off-season harvest is January to June with limited harvest. The purpose of this study was to find the concentration of paclobutrazol and the level of drought stress for off-season strawberry production. This research conducted on April to July 2023. The experiment used a factorial Randomized Block Design consisting of 2 factors and 3 replications with 16 treatment combinations. The first factor was paclobutrazol consisting of four levels, namely P_0 = control, P_1 = 10,000 ppm, P_2 = 20,000 ppm and P_3 = 30,000 ppm and the second factor was the level of drought stress consisting of four levels i.e. C_0 = 100% field capacity, C_1 = 80% field capacity, C_2 = 60% field capacity and C_3 = 40% field capacity. The results showed that paclobutrazol accelerated flowering time, increased fruit set, leaf relative water content, root length, chlorophyll content, but decreased the number of fruits formed, harvested fruits, fruit diameter, harvested fruit weight, weight per fruit, root oven dry weight, percentage of fallen fruits and total soluble solids. Drought stress level increased leaf relative water content, root length, root oven dry weight, percentage of fallen fruit, percentage of fruit set, but decreased number of flowers formed, fruits harvested, weight of fruits harvested, weight per fruit, fruit diameter, total soluble solids, chlorophyll content and delayed flowering time.

Keywords: Drought stress; Off-season; Paclobutrazol; Strawberry

1. Introduction

Strawberry (*Fragaria sp.*) is one of the important horticultural commodities in the world, especially for countries that have a tropical climate. Strawberries are a type of annual plant where strawberries can live up to two years. Based on Bali central statistics agency data [1] shows that the national production of strawberries reached 98,596 tons. Indonesia has the potential to develop strawberry plants for consumption as fresh fruit or processed fruit. Pancasari Village is one of the strawberry producing villages in Bali Province. In the period of January to June strawberry production has decreased due to high rainfall. To support production during the off-season can be done by modifying the growing environment, namely providing the application of growth regulators and drought stress.

One of the growth regulators that can be used to shift vegetative growth towards generative growth is paclobutrazol. Paclobutrazol is able to increase the average peach fruit weight up to 49% [2], increase the weight and percentage of total pear yield [3], increase the yield and number of apple fruits [4]. Meanwhile Rumada et al. [5] reported paclobutrazol is able to accelerate the time to start appearing flowers on mangosteen plants.

Apart from the application of paclobutrazol, drought stress can be used to increase crop production. Rahayu et al. [6] reported that the duration of drought stress given for 2 weeks accelerated the flowering time in Madura tangerine

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plants. Research result Roosa et al. [7] reported that soil moisture content of 75% field capacity produced higher plant height, number of stolons and chlorophyll content in strawberry plants.

2. Material and methods

The research was conducted from April to July 2023 in a strawberry farm owned by a farmer in Pancasari Village, Sukasada Subdistrict, Buleleng Regency with coordinates 8°14'42.3 "S 115°09'03.1 "E located in the highlands at an altitude of 1,300 m above sea level (asl). Observations were conducted in the field and Agronomy and Horticulture Laboratory, Faculty of Agriculture, Udayana University. The study used 5.5-month-old strawberry plants. The plants have been fruiting and producing. The materials used include paclobutrazol, manure, KNO3 fertilizer and compound NPK fertilizer. The tools used include tools for paclobutrazol application, chlorophyll meter SPAD (Soil Plant Analysis Development) 502, petri dish, oven, 60watt bohlamp, caliper, hand counter, analytical balance, and °Brix Refractometer 0-32%.

The study used a factorial randomized group design with two factors. The first factor was paclobutrazol concentration with four levels: 0 ppm (P_0), 10,000 ppm (P_1), 20,000 ppm (P_2) and 30,000 ppm (P_3). The second factor is drought stress with four levels: 100% field capacity (C_0), 80% field capacity (C_1), 60% field capacity (C_2) and 40% field capacity (C_3). Thus, 16 treatment combinations were repeated 3 times so that there were 48 experimental units.

Variables observed included: height per plant, flowering time, relative water content of leaves, chlorophyll content of leaves, root length, root oven dry weight, number of flowers formed, number of fruits formed, percentage of fruit set, number of harvested fruits per plant, percentage of fallen fruits, weight of harvested fruits per plant, average weight per fruit, total soluble solids and fruit diameter. Then observation data were analyzed using Analysis of variance (Anova). Single factors were further tested using the least significant difference (LSD) test at the 5% level.

3. Results

3.1. Plant height

The treatment of paclobutrazol had a very significant effect on plant height. In the P_2 treatment, the plant height was the lowest compared to the control. Drought stress treatment had no significant effect on plant height but there was a tendency in the C_3 treatment to be lower than the control presented in Table 1.

Table 1 Effect of paclobutrazol treatment and drought stress on plant height (cm), leaf chlorophyll content (SPAD), leaf relative water content (%) and root length (cm)

Treatment	Plant height (cm)			Leaf chlorophyll content (SPAD)			Relative water content of leaves (%)			Root length (cm)		
Concentration of paclobutrazol (ppm)												
P_0	12.33	(3.13)	a	35.62	(5.22)	c	35.27	(5.17)	bc	26.59	(4.52)	a
P_1	6.39	(2.31)	bc	36.23	(5.26)	b	34.27	(5.06)	d	27.13	(4.56)	a
P_2	6.18	(2.28)	d	36.88	(5.31)	a	41.59	(5.54)	a	27.01	(4.54)	a
P_3	6.28	(2.30)	cd	36.63	(5.29)	ab	35.11	(5.17)	cd	27.30	(4.58)	a
LSD 5%	0.10			0.03			0.25			0.10		
Drought stress (%)												
C_0	10.76	(2.54)	a	36.61	(5.29)	a	37.51	(5.33)	a	25.44	(4.43)	c
C_1	10.27	(2.49)	a	36.39	(5.28)	a	36.50	(5.25)	a	26.39	(4.49)	bc
C_2	10.41	(2.51)	a	36.36	(5.27)	ab	38.17	(5.28)	a	28.46	(4.67)	a
C_3	10.14	(2.48)	a	35.98	(5.25)	b	34.37	(5.08)	b	27.74	(4.62)	a
LSD 5%	0.10			0.03			0.25			0.10		

Description: Numbers followed by the same letter in the same treatment and column show no significant difference in the 5% level of the least significant difference test (LSD). The numbers in parentheses are the result of data transformation. While the numbers that are not in parentheses are the original data.

3.2. Leaf chlorophyll content (SPAD)

Paclobutrazol treatment significantly increased leaf chlorophyll content. The highest leaf chlorophyll content was obtained in P_2 at 36.88 SPAD but not significantly different from P_1 (36.23 SPAD) and P_3 (36.53 SPAD). The smallest leaf chlorophyll content obtained in P_0 (35.62 SPAD) was significantly different from P_1, P_2, P_3. In the drought stress treatment, the highest leaf chlorophyll content was obtained in C_0 (36.62 SPAD) and was not significantly different from C_1 and C_2 (36.39 SPAD) and (36.36 SPAD) respectively but significantly different from C_3 (35.98 SPAD) presented in Table 1.

3.3. Leaf relative water content (%)

In paclobutrazol treatment, the highest leaf relative water content was obtained in P_2 which was 41.59% significantly different from other treatments. The lowest leaf relative water content was obtained in P_1 34.27%. In the drought stress treatment, the relative water content of leaves was not significantly different in all treatments. However, there is a tendency that the highest leaf relative water content in C_2 is 38.17% and the lowest is obtained in C_3 (34.37%) presented in Table 1.

3.4. Root length

Root length in the treatment of paclobutrazol concentration was not significantly different in all treatments, but there was a tendency for the longest roots in P_3 which was 27.30 cm higher than P_0 by 2.60%. In the drought stress treatment, the longest root length obtained in C_2 was not significantly different from C_1 and C_3 with each root length of 28.46 cm, 26.39 cm and 27.74 cm but significantly different from C_0 (25.44 cm) presented in Table 1.

3.5. Time to flowering (DAT)

In the treatment of paclobutrazol concentration, the fastest flowering time was obtained in P_2, which was 7.50 days after treatment (DAT), significantly different from the treatment of P0, P_1, and P_3 with flowering time of 17.44 DAT, 17.63 DAT and 17.44 DAT, respectively. In terms of treatment P_2 is faster flowering compared to P_1 which is 57.45%. In the treatment of drought stress, all treatments had no significant effect on flowering time, but there was a tendency for faster flowering time at C_2 13.63 DAT presented in Table 2.

3.6. Number of flowers formed (florets)

The highest number of flowers formed in paclobutrazol treatment was obtained in P_0 (8.00 florets) and significantly different from P_1 (5.00 florets), P_2 (6.00 florets) and P_3 (7.00 florets). In this case the number of flowers formed in P_0 is more than P_1 by 37.5%. In the drought stress treatment, the highest number of flowers formed was obtained in C_0 which was 7.00 flowers and significantly different from all treatments C_1, C_2 and C_3 which were each 6.00 flowers presented in Table 2.

3.7. Number of fruits formed

In the treatment of paclobutrazol, the highest number of fruits formed was obtained in the control treatment (6.00 fruits), significantly different from the treatments P_1 (4.00 fruits), P_2 (4.00 fruits) and P_3 (5.00 fruits). This shows that the number of fruits formed in P_0 is higher than P_1 and P_2 by 33.33%. While in the drought stress treatment, the number of fruits formed was highest in C_0 (6.00 fruits) and not significantly different in C_3 (6.00) but significantly different in C_1 (4.00) and C_2 (4.00) presented in Table 2.

3.8. Number of harvest fruits

In the paclobutrazol treatment, the highest number of harvested fruits was obtained in the P_0 treatment (4.06 fruits) significantly different from P_1, P_2, and P_3 which were 1.09, 0.56 and 0.69 fruits, respectively. In the drought stress treatment, the highest number of harvested fruits was obtained in the C_0 treatment (2.00 fruits) and was not significantly different from C_2 and C_3 which had values of 1.50 fruits and 1.63 fruits respectively but significantly different from C_1 presented in Table 2.

3.9. Fruit diameter (mm)

The largest fruit diameter in paclobutrazol treatment was obtained in P_0 (13.49 mm) and significantly different from other treatments. The smallest fruit diameter was given to P_2 (5.01 mm). In the drought stress treatment, the largest fruit diameter was obtained in the C_0 treatment which was 10.87 mm, significantly different from the other treatments presented in Table 3.

Table 2 Effect of paclobutrazol treatment and drought stress on time to flowering (DAT), number of flowers formed (florets), number of fruits formed (fruits) and number of fruits harvested (fruits)

Treatment	Flowering start time (DAT)			Number of flower formed (florest)			Number of fruit formed (fruit)			Number of fruit harvested (fruit)		
Concentration of paclobutrazol (ppm)												
P_0	17.44	(3,40)	a	8.00	(3.00)	a	6.00	(2.25)	a	4.06	(1.83)	a
P_1	20.14	(3,61)	a	5.00	(2.00)	c	4.00	(1.76)	d	1.09	(1.08)	a
P_2	7.50	(2,49)	b	6.00	(2.00)	bc	4.00	(1.96)	c	0.56	(0.96)	a
P_3	17.44	(3,36)	a	7.00	(2.00)	ab	5.00	(2.04)	bc	0.69	(0.99)	a
LSD 5%	0.51			1.00			0.13			1.38		
Drought stress (%)												
C_0	14.00	(3.07)	a	7.00	(2.00)	a	6.00	(2.16)	a	2.00	(1.31)	a
C_1	14.13	(3.07)	a	6.00	(2.00)	a	4.00	(1.91)	b	1.19	(1.08)	a
C_2	16.14	(3.31)	a	6.00	(2.00)	a	4.00	(1.77)	c	1.50	(1.22)	a
C_3	18.25	(3.41)	a	6.00	(2.00)	a	6.00	(2.16)	a	1.63	(1.25)	a
LSD 5%	0.51			1.00			0.13			1.38		

Description: Numbers followed by the same letter in the same treatment and column show no significant difference in the 5% level of the least significant difference test (LSD). The numbers in parentheses are the result of data transformation. While the numbers that are not in parentheses are the original data.

3.10. Total fruit weight (g)

The highest total fruit weight in paclobutrazol treatment was obtained in P_0 (18.68) significantly different from all treatments P_1 (2.78 g), P_2 (2.00 g) and P_3 (2.50 g). The lowest fruit weight was given by P_2 and significantly different from P_0, P_1 and P_3. In relation, P_0 treatment gave higher weight than P2 by 89.29%. In the drought stress treatment, the highest fruit weight was obtained in C_0 which was 9.98 g and significantly different from C_1 and C_2 and C_3 respectively (4.66 g), (6.34 g) and (4.97 g) presented in Table 3.

3.11. Total soluble solids (PTT) (^{o}Brix)

In paclobutrazol treatment, the highest total soluble solid was obtained in P0 (5.71 oBrix), significantly different from other treatments. The lowest total soluble solid was given to the treatment P3 (1.26 Brix) which was not significantly different from P2, but significantly different from P1. In relation to total soluble solids P0 was higher than P3 by 77.93%. In the drought stress treatment, the highest total soluble solid was given to C0 (3.97 oBrix) and significantly different from C1 and C2 respectively 2.76 oBrix and 2.51 oBrix but not significantly different from C3 presented in Table 3.

3.12. Average weight per fruit (g)

In the paclobutrazol treatment, the highest average weight per fruit was obtained in P_0 (3.27g), significantly different from P_1 (1.68). P_1 treatment was significantly different from P_2 and P_3 which were 1.19 g and 0.91 g respectively but P_2 and P_3 were not significantly different. In this case, the average weight per fruit in P_0 was higher by 72.87% than P_3 Percentage of fruit set (%) presented in Table 3.

In the drought stress treatment, the average weight per fruit in C_0 (2.26 g) was higher than the treatments C_1 (1.15 g), C_2 (2.13 g), C_3 (1.51 g) which were not significantly different in all treatments. In this case the average weight per fruit in C_1 is smaller than C_0 by 49.37% presented in Table 3.

Table 3 Effect of paclobutrazol treatment and drought stress on fruit diameter, total fruit weight, soluble solids and average weight per fruit

Treatment	Fruit diameter (mm)			Total fruit weight (g)			Soluble solids (°Brix)			Average weight per fruit (g)		
Concentration of paclobutrazol (ppm)												
P_0	13.49	(3.25)	a	18.68	(3.53)	a	5.71	(1.95)	a	3.27	(1.73)	a
P_1	6,66	(2.07)	b	2.78	(1.48)	bc	3.49	(1.45)	b	1.68	(1.27)	b
P_2	5.01	(1.72)	d	1.00	(1.28)	d	1.67	(1.10)	cd	1.19	(1.11)	c
P_3	5.57	(1.76)	cd	2.50	(1.29)	cd	1.26	(1.04)	d	0.91	(1.03)	c
LSD 5%	0.32			0.31			0.29			0.13		
Drought stress (%)												
C_0	10.87	(2.79)	a	9.98	(2.24)	a	3.97	(1.59)	a	2.66	(1.44)	a
C_1	4.53	(1.59)	c	4.66	(1.56)	c	2.76	(1.36)	a	1.15	(1.09)	c
C_2	8.01	(2.30)	ab	6.34	(1.99)	ab	2.51	(1.27)	b	2.13	(1.39)	a
C_3	7.31	(2.12)	bc	4.97	(1.80)	b	2.90	(1.32)	ab	1.51	(1.23)	b
LSD 5%	0.32			0.31			0.29			0.13		

Description: Numbers followed by the same letter in the same treatment and column show no significant difference in the 5% level of the least significant difference test (LSD). The numbers in parentheses are the result of data transformation. While the numbers that are not in parentheses are the original data.

Table 4 Effect of paclobutrazol treatment and drought stress on fruit set percentage (%), fruit drop percentage (%) and oven dry weight (g)

Treatment	Fruit set percentage (%)			Percentage of fruit fall (%)			Oven dry weight (g)		
Concentration of paclobutrazol (ppm)									
P_0	0.15	(2.93)	ab	28.56	(4.39)	C	12.39	(3.12)	a
P_1	0.19	(3.17)	a	53.92	(6.08)	B	8.99	(2.68)	b
P_2	0.11	(2.27)	b	63.69	(6.92)	A	8.70	(2.63)	cd
P_3	0.18	(3.24)	a	61.40	(6.54)	Ab	8.71	(2.63)	d
LSD 5%	0.66			0.64			0.13		
Drought stress (%)									
C_0	0.13	(2.70)	c	53.21	(6.19)	Ab	8.94	(2.66)	b
C_1	0.17	(2.92)	bc	59.05	(6.51)	A	9.91	(2.79)	a
C_2	0.25	(3.80)	a	44.82	(5.37)	C	9.73	(2.78)	a
C_3	0.09	(2.18)	d	48.19	(5.85)	Bc	10.21	(2.83)	a
LSD 5%	0.66			0.64			0.13		

Description: Numbers followed by the same letter in the same treatment and column show no significant difference in the 5% level of the least significant difference test (BNT). The numbers in parentheses are the result of data transformation. While the numbers that are not in parentheses are the original data.

3.13. Percentage of fruit set (%)

In paclobutrazol treatment, the highest percentage of fruit set was in P_1 (19.44%), which was not significantly different from P_0 and P_3, which were 14.56% and 18.40%, respectively. The lowest percentage of fruit set was obtained in P_2 (10.75%) and significantly different in all treatments. In the drought stress treatment, the highest percentage of fruit set was obtained in C_2 which was 24.55% significantly different from C_0 (13.06%), C_1 (16.33%) and C_3 (8.72%). The lowest percentage of fruit set obtained in C_3 is presented in Table 4.

3.14. Percentage of fruit drop (%)

The highest percentage of fallen fruit in paclobutrazol treatment was obtained in P_2 (63.69%) which was not significantly different from P_3 but significantly different from P_0 and P_1 which were 28.56% and 53.92% respectively. The lowest percentage of fallen fruit was obtained in P_0. In the drought stress treatment, the highest percentage of fallen fruit was obtained in C_1, 59.05%, which was not significantly different from P_0, but significantly different from C_2 and C_3, 44.82% and 50.49% respectively. The lowest percentage of fallen fruit was obtained in C_2 (44.82%) and significantly different from C_0, C_1 and C_3 presented in Table 4.

3.15. Root oven dry weight (g)

In paclobutrazol treatment, the highest root oven dry weight was obtained at P_0 (12.39 g), significantly different from other treatments. The lowest oven dry weight was given to P_2 (8.70 g) which was not significantly different from P_1 and P_3 levels. In the drought stress treatment, the highest oven dry weight was obtained in C_3 which was 10.21 g and was not significantly different from C_1 and C_2 but significantly different from C_0 (8.94 g) presented in Table 4.

4. Discussion

Total weight of harvested fruit per plant was highest in the treatment without paclobutrazol P_0 (18.68 g). The high total weight of harvested fruit in the P0 treatment was supported by the variable of fruit formed which was proven by the correlation value of fruit formed to the total weight of harvested fruit with a real positive correlation (r = 0.5640*). The number of flowers formed is also one of the variables that support high total fruit weight as evidenced by the correlation value of flowers formed to the total weight of harvested fruit with a significant positive correlation (r = 0.7517*) and shows that P0 tends to produce more flowers. This is supported by the results of research [8] in the results of his research the use of 300 ppm paclobutrazol decreased the number of fruits and fruit weight in tomato plants, as well as research conducted [9] paclobutrazol treatment did not increase the number of flowers on chili plants. The decrease that occurred was thought to be due to the concentration of paclobutrazol which was too high, thus disrupting the metabolic process in the plant. This is also supported by the variable percentage of fallen fruit in the P_0 treatment which is smaller (28.56%) compared to the P_2 paclobutrazol treatment (63.69%). Flowering time in this study the use of paclobutrazol P_2 20,000 ppm accelerated the beginning of flowers compared to other treatments. This study is in line with [5] that paclobutrazol treatment can accelerate the time of the first flower appearance on mangosteen.

The lowest harvest fruit weight was obtained in the treatment of paclobutrazol concentration of 20,000 ppm P_2 (2.00 g) which in this case the application of paclobutrazol reduced the harvest fruit weight per plant by 89.29%. The treatment of paclobutrazol caused the total weight of harvested fruit to decrease. It was thought to be due to the high concentration of paclobutrazol that caused the process of fruit development to be inhibited. The results showed that the use of paclobutrazol made the number of fruits less than without paclobutrazol. Similar results were reported by [10] that the weight of harvested fruit with treatment without paclobutrazol was higher than with paclobutrazol treatment in tomato plants.

The high number of fruits and the number of flowers formed is influenced by plant growth. Evidently the number of fruits formed is supported by a positive correlation in plant height to the number of fruits formed (r = 0.3647) and a real positive correlation to the number of flowers formed (r = 0.6083*). The real positive correlation value shows that the higher the value of plant height, the more flowers formed. This is in line with research [9] that the application of paclobutrazol inhibits the height of potted chrysanthemum flower plants.

As a result of the high concentration of paclobutrazol, fruit enlargement is disrupted so that in the treatment of paclobutrazol, the diameter of the fruit tends to be smaller than without paclobutrazol. The average value of weight per fruit is one of the important variables that affect the harvest weight because the higher the average value of weight per fruit, the value of total fruit weight will increase as evidenced by the real positive correlation value on the average weight per fruit to the total fruit weight (0.5894*). High harvest fruit weight is also supported by the variable number of harvest fruits as evidenced by a real positive correlation to harvest fruit weight (r = 0.9314*). High total fruit weight was supported by rapid flowering time as evidenced by a positive correlation value (r = 0.2952) to total fruit weight and was also supported by fruit set percentage as evidenced by a positive correlation value to total fruit weight (r = 0.0381).

Chlorophyll content, leaf relative water content and root oven dry weight in the paclobutrazol treatment were higher than the treatment without paclobutrazol. These three variables did not support the total weight of harvested fruits as indicated by the correlation value of chlorophyll content, leaf relative water content and oven dry weight to total fruit weight with a negative correlation (r = -0.3972). Low chlorophyll content causes the photosynthesis process to run slowly and affects the growth of fruit weight. According to [11], the chlorophyll content of each chloroplast increased in

beet plants treated with paclobutrazol. In this treatment, the chlorophyll content in P_2 (36.88 SPAD) was higher than P_0 (35.62 SPAD). This study is in accordance with [12] that paclobutrazol treatment increases chlorophyll content in siamese orange plants.

Drought stress treatment at C_0 control showed the total weight of harvested fruit (9.98 g) and fruit diameter (10.87 mm) higher than the total weight of harvested fruit at 80% stress level C_1 (4.66) and fruit diameter C_1 (4.53 mm). This is supported by 6 other variables, namely plant height (8.07 cm), number of flowers formed (7.00 florets), number of fruits formed (5.69 fruits), number of harvested fruits (2.00 fruits), average weight per fruit (2.26 g) and total soluble solids (3.97 ^{o}Brix) which have high values compared to the 80% water stress level. These results are in line with research [13] that normal water levels (100%) showed a higher number of flowers, number of fruits and fruit diameter. This is evidenced by the positive correlation to fruit weight. However, root length in P_3 drought stress treatment at 60% of field capacity showed higher root length compared to normal water application. Root length was not correlated to the number of flowers formed, number of fruits formed, number of fruits harvested, number of fruits dropped, total fruit weight and soluble solids. Meanwhile, [14] reported that drought stress did not significantly increase root length.

The high number of fruits formed will increase the total weight of harvested fruits, this is supported by the average weight per fruit significantly positively correlated with the total weight of harvested fruits (r = 0.5894*). This is supported by the relative water content (RWC) of the leaves which is characterized by a positive correlation value of RWC leaves to the average weight per fruit (r = 0.1675). The low leaf chlorophyll in drought stress treatment caused the plant to produce not optimal, characterized by a negative correlation value of leaf chlorophyll to the number of flowers formed (r = -0.2171), percentage of fruit set (r = -0.1652), number of fruits harvested (r = -0.3704), weight per fruit (r = -0.4794*) and total fruit weight (r = -0.3972). The percentage of fallen fruit has a direct influence on the total weight of harvested fruit and weight per fruit as evidenced by the significant negative correlation values of (r = -0.7431*) and (r = -0.4345*) respectively. The correlation values illustrate that the higher the percentage of fallen fruit, the lower the total harvest weight and weight per fruit.

5. Conclusion

Paclobutrazol treatment increased fruit set, chlorophyll content, leaf relative water content, root length, accelerated flower emergence time, decreased number of fruits formed, number of harvested fruits, fruit diameter, weight per fruit, root oven dry weight, total soluble solids, and harvested fruit weight. Drought stress treatment increased leaf relative water content, root length, root oven dry weight, percentage of fruit set and decreased leaf chlorophyll content, percentage of fallen fruit, number of flowers formed, number of harvested fruits, fruit diameter, weight per fruit, total soluble solids, harvested fruit weight and slowed down flowering time. The interaction between paclobutrazol treatment and drought stress had no significant effect on all observation variables.

Suggestion

Further research needs to be done on the use of paclobutrazol on strawberry plants with lower concentrations because the lowest concentration of 10,000 ppm still greatly suppresses strawberry growth. In addition, to determine the field capacity, do preliminary experiments more than once.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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