How to Cite:
Al-Mousawi, S. J. K., & Al-Zubaidi, B. H. F. (2022). The effect of Gorogreen five fructus and the type of pollination on sugars and maturity rate of Barhi variety produced from tissue culture. *International Journal of Health Sciences*, *6*(S3), 6438–6445. https://doi.org/10.53730/ijhs.v6nS3.7419

The effect of Gorogreen five fructus and the type of pollination on sugars and maturity rate of Barhi variety produced from tissue culture

Sarah Jawad Kadhum Al-Mousawi
Suq Al-Shoyokh Agriculture Division, Thi-Qar Agriculture Directorate, Ministry of Agriculture, Iraq
*Corresponding author email: Sarhjawad4. Post. am@utq.edu.iq

Batool Hanoon Faleh Al-Zubaidi
Department of horticulture and landscaping engineering, Faculty of Agriculture and Marshlands, University of Thi-Qar, Iraq

***Abstract*---**This study was conducted during the season 2020-2021, at one of the private orchards located in the south of Thi-Qar Governorate, cultivated with the date palm (Phoenix dactylifera L.), Barhi variety, produced from tissue culture at the age of 6 years, to study the effect of spraying with Gorogreen five fructus, with four concentrations (0, 0.5, 1 and 1.5) ml L-1, pollination variety represented by the two varieties of Al-Ghanami green and Al-Khakri, as well as the interaction between them during the Khalal and Rutab phases. The results indicated the significant superiority of spraying Gorogreen five fructus at a concentration of 1.5 ml L-1 in the maturity percentage, as well as the significant superiority of Al-Ghanami green on some total sugars during the Khalal and Rutab phases, reducing sugars at Rutab phase, sucrose in the Khalal phase, in addition to the moral superiority on the percentage of maturity.

***Keywords*---**Gorogreen five fructus, pollination, sugars, maturity, Barhi variety.

Introduction

The date palm (*Phoenix dactylifera* L.), one of the trees whose name and history have been associated with the Arab region since ancient times. Iraq is one of the most date-producing countries in the world, however, the productivity of palm trees in Iraq has been declining in recent years, under environmental conditions, as well as relying on traditional and slow production methods, lack of application of modern technologies with weak agricultural service operations, which was one

of the most important factors affecting the success and production of palm cultivation, as tissue culture was considered one of the fastest and safe ways, to fill the shortfall in the number of date palms (Al-Kubaisi, 2007). Hamid (2001) in Iraq found a program to propagate several varieties of date palms, by plant tissue culture, during the past few years of this century, where the cultivation of date palm tissues has taken important steps in the paths of modernization, to return the palm trees to the areas from which they disappeared, increasing the agricultural area in other areas.

The use of nutrients has many benefits when using them, as rebalancing and revitalizing the vital processes of the plant, increased crop yield and high quality chemical-free, fertilization with nutrient solutions is an important component, it fills a large part of the fertilizer needs, it saves a lot of money spent on its production (Taiz and Zeger, 2002). Many crops are associated with the use of nutrient solutions, increases the amount of proteins, which achieve balance in food components at the lowest costs and without pollution to the environment (Dinare *et al.*, 2012). This study was conducted to investigate the effect of two types of male pollen (Al-Ghanami green and Khakri), and the effect of Gorogreen five fructus on sugars and the ripening rate of date palm fruits (Barhi variety).

Materials and Methods

This study was conducted during the season 2020-2021, at one of the private orchards located in the south of Thi-Qar Governorate, cultivated with date palms obtained from tissue culture at the age of 6 years, to study the effect of two types of male pollen (Al-Ghanami green and Khakri), effect of Gorogreen five fructus on sugars and ripening percentage of date palm fruits (Barhi variety), the Barhi variety was chosen because it is one of the rare varieties, which was concentrated in the province of Thi-Qar. Palm trees were pollinated on 3/29/2021, where all four bunches from each palm were pollinated with the type of pollen Al-Khkri. The second four of the same palm were pollinated with the Al-Ghanami green pollination. Al-Ghanami green variety was considered one of the best known male varietys, which was widely cultivated in Thi-Qar Governorate. This variety was chosen for its superiority in the vitality and germination of its pollen grains over the rest of the other male varietys of date palm distributed in Thi-Qar Governorate. The trees were manually pollinated and all agricultural operations were carried out of individuation, dangling, pest control, according to the method and methods used in the palm groves in the region.

Study treatments

- The first factor: the type of pollination, where palm trees were pollinated with two different types of male pollen (Ghanami and Khakri varieties).
- The second factor:
  - Gorogreen five fructus feeder:
    The process of spraying the taste of date palms (Barhi variety) was carried out with Gorogreen five fructus in four concentrations (0, 0.5, 1 and 1.5) ml L^{-1} in the form of batches between each spray and the other for seven days.

Statistical analysis

Statistical analysis of all studied traits was carried out using factorial experiments (Factorial) according to the complete sectors design (RCBD) by the ready-made statistical program SPSS (2012), and the averages were compared to calculate the least significant difference (LSD) at the level of significance 0.05.

Results and Discussion

Total sugars (%)

Table (1) shows the effect of Gorogreen five fructus concentration per ml L^{-1} and pollen variety and the interaction between them, on percentage of total sugars (%), during the Khalal phase of the Barhi variety produced by tissue culture, the green Al-Ghanami variety had a significant effect on the percentage of sugars by giving the highest value of 40.19 in comparison with Al-Khkri variety by 36.57%. The results also indicated that the concentrations of spraying with Gorogreen five fructus feeder were 1 ml L^{-1} at levels (0, 0.5, 1 and 1.5) ml L^{-1}, led to the superiority of the treatment 1.5 ml L^{-1} in giving the highest rate of sugars by 40.69%, compared to the comparison treatment, which gave the lowest rate of 36.15%.

Table 1
Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of total sugars (%) during the Khalal phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	37.78	39.14	41.09	42.76	40.19
Al-Khkri	34.51	35.92	37.24	38.62	36.57
Mean	36.15	37.53	39.16	40.69	
$L.S.D_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	0.542		0.766		1.083

Table (2) shows the effect of Gorogreen five fructus concentration and pollen variety and the interaction between them, on total sugars (%), during the Rutab phase of the Barhi variety produced by tissue culture, the treatments of green Al-Ghanami were significantly superior to giving the highest rate, the treatments of the Al-Khkri variety amounted to 49.53 and 46.20% respectively. The effect of Gorogreen five fructus concentrations at levels 0, 0.5, 1 and 1.5 ml L^{-1}, it had a significant effect on total sugars (%), where the spray treatment was significantly superior to 1.5 ml L^{-1}, by giving the highest rate of total sugars to the fruit by 54.35%, compared to the comparison treatment, which gave the lowest rate of 42.78%.

Table 2
Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of total sugars (%) during the Rutab phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	44.04	46.01	51.25	56.80	49.53
Al-Khkri	41.51	44.09	47.29	51.89	46.20
Mean	42.78	45.05	49.27	54.35	
$L.S.D_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	1.590		2.249		3.181

The reason may be attributed to the effect of the nutrient solution on the percentage of total sugars, because of what the solution contains, which acts as a catalyst to increase the activity of enzymes in the vital processes within the fruit, especially the enzymes responsible for maturation such as invertase and cellulose, which helps convert sucrose into reducing sugars, thus, the concentration of total sugars in the fruit increases (Al Maraqi, 2005). As for the effect of the Pollen variety on increasing the percentage of total sugars on the fruits of the Barhi palm, because of the properties of the pollen variety from the effects of metamazine, which encourages the tissues of the fruit to produce new hormones, it will encourage the transfer of sugary substances to the fruit, thus increasing the concentration of total sugars inside the fruit. The results of this study agree with many researchers (Abd and Abbas, 2007; Al-Asadi, 2009, by their study of the effect of the Pollination variety on the percentage of total sugars.

Reducing sugars (%)

Table (3) shows the effect of Gorogreen five fructus concentrations, at levels 0, 0.5, 1 and 1.5 ml L^{-1}, pollen variety and the interaction between them on percentage of reducing sugars (%) at Khala phase, for the Barhi variety produced from tissue culture. The green Al-Ghanami variety has a significant effect on reducing sugars, by giving the lowest value of 13.43%, compared to the charity classified by 14.15%. The results also showed that spraying with Gorogreen five fructus nutrient at levels 0, 0.5, 1 and 1.5 ml L^{-1}, the treatment was superior to 1.5 ml L^{-1}, by giving the lowest rate of sugars by 12.34%, compared to the comparison treatment, which gave the highest rate of 15.16%.

Table 3
Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of reducing sugars (%) during the Khalal phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	14.96	13.76	1309	11.92	13.43
Al-Khkri	15.36	14.70	13.79	12.75	14.15
Mean	15.16	14.23	13.44	12.34	

L.S.D$_{0.05}$	Pollen variety	Gorogreen five fructus	Interaction
	0.516	0.730	1.033

Table (4) indicates the effect of Gorogreen five fructus concentrations at levels 0, 0.5, 1 and 1.5 ml L^{-1} and the pollen variety and the interaction between them on percentage of reducing sugars (%), during the Rutab phase of the Barhi variety produced by tissue culture, the treatments of the green Al-Ghanami variety significantly outperformed, by giving the highest rate, compared to the treatments of the Khokri variety, which amounted to 36.08 and 31.75%, respectively. Spraying with Gorogreen five fructus, at levels (0, 0.5, 1 and 1.5) ml L^{-1}, the treatment was superior to 1.5 ml L^{-1}, by giving the highest rate of sugars by 41.54%, compared to the comparison treatment, which gave the lowest rate of 27.85%.

Table 4
Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of reducing sugars (%) during the Rutab phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	29.70	31.93	38.10	44.58	36.08
Al-Khkri	26.00	29.29	33.21	38.50	31.75
Mean	27.85	30.61	35.65	41.54	
L.S.D$_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	1.645		2.326		3.290

The reason may be due to the role of the components of the nutrient solution used, and its nutrients, its effect on increasing the content of the ethylene hormone in the fruit, which activates the genes responsible for the activity of enzymes, including the hormones responsible for converting sucrose into reducing sugars in the tissues of the fruit (Al-Mubarak, 2014).The pollen variety may have a role in increasing the speed and activity of the invertase enzyme activity, which leads to the conversion of the form of disaccharides to reducing monosaccharides (glucose and fructose), increasing the content of reducing sugars in the fruits. These findings are in agreement with Abd and Abbas (2007); Al-Asadi (2009) through their study of the effect of the pollen variety on the proportion of reducing sugars.

Sucrose (%)

Table (5) shows the effect of Gorogreen five fructus concentrations, at levels 0, 0.5, 1 and 1.5 ml L^{-1} and pollen variety and the interaction between them, on the percentage of sucrose (%) in the Khalal phase of the Barhi variety obtained from tissue culture, the green Al-Ghanami variety had a significant effect on the sucrose content, by giving the highest value of 26.76%, compared to Al-Khkri class, 22.42%. Spraying with the Gorogreen five fructus nutrient, at levels (0, 0.5, 1 and 1.5) ml L^{-1}, the treatment resulted in the superiority of the treatment 1.5 ml

L^{-1} by giving the highest rate of sucrose by 28.35%, compared to the comparison treatment, which gave the lowest rate of 20.98%.

Table 5

Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of sucrose (%) during the Khalal phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	22.82	25.38	28.01	30.84	26.76
Al-Khkri	19.15	21.22	23.45	25.87	22.42
Mean	20.98	23.30	25.73	28.35	
$L.S.D_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	0.777		1.099		1.554

Table (6) shows the concentrations of Gorogreen five fructus, at levels 0, 0.5, 1 and 1.5 ml L^{-1} and pollen variety and the interaction between them, on the percentage of sucrose (%) in the Rutab phase of Barhi cultivar obtained from tissue culture, the green Al-Ghanami variety had a significant effect on sucrose by giving the lowest value of 13.44%, compared to Al-Khkri variety, 14.93% .Spraying with Gorogreen five fructus feeder at levels 0, 0.5, 1 and 1.5 ml L^{-1}, the treatment resulted in the superiority of the treatment 1.5 ml L^{-1} in giving the lowest rate of sucrose by 12.81%, compared to the comparison treatment, which gave the highest rate of 14.93%.

Table 6

Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of sucrose (%) during the Rutab phase of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	14.33	14.07	13.15	12.22	13.44
Al-Khkri	15.52	14.79	14.01	13.39	14.43
Mean	14.93	14.43	13.58	12.81	
$L.S.D_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	0.321		0.454		0.642

Low sucrose may be due to the effect of the nutrient solution, because it contains nutrients, contributes to the effect of accelerating the ripening of fruits, by its effect on the activity of the enzymes responsible for maturation (invertase and cellulase), its effect on the cells of solutes, led to a high content of sugars and a decrease in sucrose in the fruits, nutrient treatment, due to the accumulation of sugars and their transformations, especially the invertase enzyme, which has an important role in the process of sucrose hydrolysis. The reason for the difference may be attributed to the rate of decomposition of sucrose in fruits, resulting from both pollen variety, to the difference in the date of production of ethylene (Abass and Ibrahim, 1998).

Maturity percentage (%)

Table (7) shows the effect of Gorogreen five fructus concentrations, at levels 0, 0.5, 1 and 1.5 ml L^{-1}, pollen variety and the interaction between them, on the percentage of fruit maturity (%) of the Barhi variety produced from tissue culture, the green Ghanami variety was significantly superior to the percentage of maturity percentage, by giving the highest rate compared to the charcoal variety amounted to 83.38 and 80.48%, respectively .The results also showed that spraying with Gorogreen five fructus nutrient at levels 0, 0.5, 1 and 1.5 ml L^{-1}, led to the superiority of the treatment 1.5 ml L^{-1} in giving the highest rate of maturity by 87.14%, compared to the comparison treatment, which gave the lowest rate of 77.07%.

Table 7
Effect of Gorogreen five fructus concentration and pollen variety and the interaction between them on the percentage of maturity percentage (%) of Barhi variety produced from tissue culture

Pollen variety	Gorogreen five fructus concentration ml L^{-1}				Mean
	0	0.5	1	1.5	
Al-Ghanami	77.86	81.30	84.89	89.48	83.38
Al-Khkri	76.29	78.91	81.92	84.80	80.48
Mean	77.07	8011	83.40	87.14	
$L.S.D_{0.05}$	Pollen variety		Gorogreen five fructus		Interaction
	1.187		1.679		2.375

The reason was due to the nutrient content of Gorogreen five fructus, it contains many elements and nutrients necessary for growth, that affect or assist in the activation of auxin, which in turn leads to an increase in the activity of the enzymes responsible for maturation (invertase and cellulase), agreed with Abu Zayd (200); Laftah (2013); Al Sardah (2014) and Al Manae (2018), by the effect of spraying with nutrient solutions on the maturity rate of fruits.

References

Abbas, M.F. and M.A. Ibrahim. 1998. The Role of Ethylene in the Regulation of Fruit Ripening in the Hillawi Date Palm (*Phoenix dactylifera* L.). J. Sci. Food Agric.,72:306-308

Abd, A.M. and M.F. Abbas. 2007. A comparative study of four varietys of pollen and their effect on some chemical and physical properties of the fruits of the date palm (*Phoenix dactylifera* L.) varietys of Umm Al-Dahn and al-Buraim. Basra Journal of Date Palm Research, 6(1): 54-63.

Abu Zaid, A.N. 2000. Plant hormones and agricultural applications, Ezz El-Din Institution for Publishing and Printing. Cairo. Egypt.

Al Manae, G.N.J. 2018. Effect of cultivar, irrigation and spraying with catarrhal growth stimulator on some characteristics of specific fruits and yield of date palm (*Phoenix dactylifera* L.). Master Thesis. faculty of Agriculture. Albasrah university

Al-Asadi, A.K.D. 2009. Effect of pollen variety and bagging periods on some physiological, physical and chemical characteristics of date palm fruits (Al Mayasi and Khadraoui varietys).

Al-Kubaisi, A.A. 2007. Studies of palm trees in the Middle East for registration and approval of agricultural varieties, the national program for the propagation and improvement of palm cultivation. Ministry of Agriculture, Republic of Iraq.

Al-Maraqi, A.J.M. 2005. Chemistry of horticultural plants. Egyptian Books and Documents House. first edition. The Egyptian Arabic Republic.

Al-Mubarak, N.R.A. 2014. Effect of spraying with Kelpak seaweed extract and NPK neutral fertilizer on some vegetative and fruiting indicators and yield components of date palm (*Phoenix dactylifera* L.) variety Barhi. Master Thesis. faculty of Agriculture. Albasrah university.

Al-Sardah, A.S.M. 2014. Effect of spraying with Fetrilon combi 2 fertilizer and the dates of application on some physical and chemical properties and yield of date palm fruits (*Phoenix dactylifera* L.), Halawi cultivar. Master Thesis. faculty of Agriculture. Albasrah university.

Dinare, M., A.A. Al-Khateeb, I.A. Al-Abdulhameed, A.K. Abugulia and G.R. Abdalla. 2012. Bunch thinning improves yield and fruit quality of date palm. Egypt. J. Appl. Scie. 17(11):228-238.

Hamid, M.K. 2001. Vegetative propagation of some date palm varietys, *Phoenix dactylifera* L. using tissue culture technology. PhD thesis. faculty of Agriculture. Baghdad University.

Lafta, A.Y. 2013. Effect of compressing periods and spraying with plant extracts on some chemical, physical and physiological characteristics of date palm fruits (*Phoenix dactylifera* L.), Al-Sayer variety. Master Thesis. faculty of Agriculture. Al-Basrah University.

SPSS.2012. SPSS users guide Statistics version 20. Statistical Package Solution Service.

Taiz, L. and E. Zeiger. 2002. Plant Physiology. 3rd ed. Sunderland: Sinauer Associates, Inc.