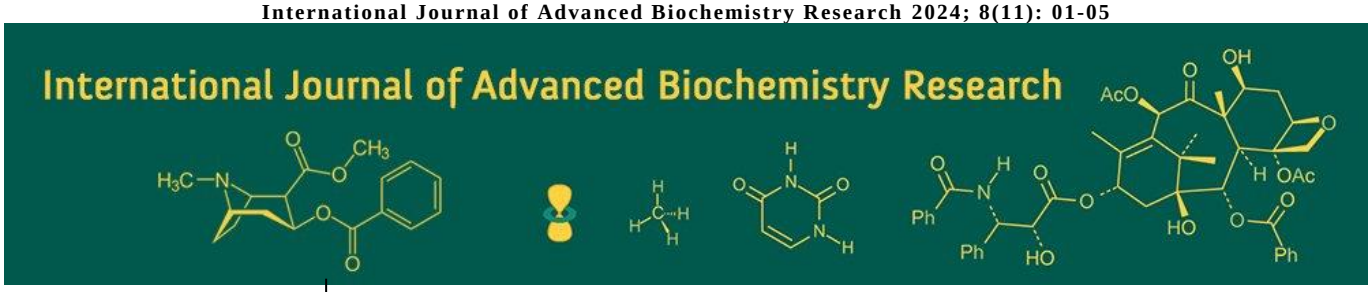

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(11): 01-05
www.biochemjournal.com
Received: 02-08-2024
Accepted: 06-09-2024

Payal C Makavana
Ph.D. Scholar, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

MJ Patel
Professor and Head, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

MH Kavad
M.Sc. Agri. in Organic Farming, Gujarat Natural Farming and Organic Agricultural University, Anand Campus, Anand, Gujarat, India

Sejal J Savdhariya
Department of Horticulture, Anand Agricultural University, Anand, Gujarat, India

Corresponding Author:
Payal C Makavana
Ph.D. Scholar, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Effect of bagging and plant growth regulators on yield attributes and yield of date palm (*Phoenix dactylifera* L.) CV. local

Payal C Makavana, MJ Patel, MH Kavad and Sejal J Savdhariya

DOI: https://doi.org/10.33545/26174693.2024.v8.i11a.2800

Abstract
The present investigation entitled "Effect of bagging and plant growth regulators on yield and quality of date palm (*Phoenix dactylifera* L.) cv. Local" were conducted during the years 2022 and 2023. Among different bagging, black colour polyethylene bag (B_3) recorded maximum number of fruits per strand, fruit weight, flesh weight, flesh: seed ratio, fruit length, fruit diameter, bunch weight and yield with minimum seed weight and number of fruits drop per bag during two years and in pooled mean. While, in case of plant growth regulators, GA_3 150 mg/l (P_1) gave maximum number of fruits per strand, fruit weight, flesh weight, flesh: seed ratio, fruit length, fruit diameter and bunch weight with minimum seed weight during two years and in pooled mean. However, NAA 100 mg/l (P_2) gave maximum yield with minimum number of fruits drop per bag during two years and in pooled mean.

Keywords: Bagging, plant growth regulators, date palm

Introduction
Date palm is a dioecious, monocotyledonous plant in the arecaceae family. It is a significant fruit and one of Egypt's main fruit crops. It is considered as one of the oldest and main staples and ancient crops in southwest Asia and north Africa. The name of the species dactylifera means "finger-bearing" which refers to the fruit clusters produced by this plant. Dactylifera is a grouping of the Greek word 'dactylus' means "finger" and the Latin word 'ferous' means "bearing" (Ashraf and Hamidi-Esfahani, 2011) [3]. In Gujarat total horticultural crops area is 18.90 lakh ha, production 263.05 lakh tons and productivity are 13.92 MT/ha. Iran is the world's largest exporter of date fruits, while India is the biggest importer. India's major date palm growing regions are Kutch (Gujarat), Rajasthan, certain parts of Punjab as well as Tamil Nadu State (Shah, 2014) [16]. In Gujarat, total area of date palm cultivation is 20,446 ha, production 19,04,58 MT and productivity is 9.31 MT/ha. (Anon., 2023) [2]. Numerous issues affect date palm cultivation, impeding its growth and progress. Rain is the primary issue facing this culture. When dates are nearing maturity, rain can seriously harm and resulting in a reduction in the amount (fruit drop) and the dates that are still on the tree losing quality.

Date palm cultivars blossoming and fruit setting phases were found to benefit from bagging their spathes, which also sped up ripening and enhanced the quality of the fruit. This particular treatment showed the highest percentage of fruit weight, flesh weight, quality and lowest percentage of tannins (El-Salhy, 2000) [9]. Because of microclimate that surrounds the bunch and the accumulated heat, pre harvest bagging of dates improves fruit setting, fruit yield and fruit quality. Plant growth regulators (PGRs) or phytohormones are organic compounds, other than nutrients, that produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts, modify plant physiological process. PGRs called bio stimulants or bio inhibitors, act inside plant cells to stimulate or inhibit specific enzymes or enzymes systems and help regulate plant metabolism.

Material and Methods

Experimental site

An experiment was conducted during the year 2022 and 2023 on six years old date palm trees planted 8.0 x 8.0 m at Horticultural Research Farm, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India which is situated geographically at 22°35' North latitude and 72°56' East longitude with an altitude of about 45.1 m above the mean sea level.

Experimental design and treatments

The experimental design was CRD with factorial concept with three repetitions. Apply well rotten FYM 100 kg/plant in the month of July with 1000 g nitrogen, 1000 g phosphorus and 1000 g potash in each plant in the form of urea, SSP and muriate of potash. Fertilizers was applied in two equal splits *i.e*., in the month of October and April. One tree was selected per treatment and total sixteen treatment combinations were carried out.

Treatment details are as under:

Factor A. Bagging (B)
B_0: No bagged (Control)
B_1: Blue colour polyethylene bag
B_2: Green colour polyethylene bag
B_3: Black colour polyethylene bag
Factor B. Plant Growth Regulators (P)
P_0: No spray (Control)
P_1: GA_3 150 mg/l
P_2: NAA 100 mg/l
P_3: Salicylic acid 100 mg/l

Spraying of plant growth regulators was done after fifteen days of pollination. Spraying of plant growth regulators, bunches were covered with 50-micron polyethylene bags of different colours *viz*., blue, green, and black, according to their individual treatments.

Mature uniform size fresh date fruits were harvested and kept in laboratory. The 10 mature fruits per treatment were randomly selected and observations regarding physical parameters like, 10 fruit weight, 10 flesh weight, 10 seed weight, flesh: seed ratio, fruit length and fruit diameter were recorded. All the observations were taken at the time of harvest. Data for individual years were analysed and in order to study the average effect of different treatments over the years, the pooled analysis was also carried out as suggested by Gomez and Gomez (1976) [11].

Results and Discussion

Effect of bagging on yield parameters and yield of date palm

The effect of bagging significantly influenced the yield attributes and yield of date palm presented in (Table 1, 2, 3 and 4). The yield parameters in terms of maximum number of fruits per strand (19.76, 20.18 and 19.97), 10 fruit weight (82.77, 83.16 and 82.96 g), 10 flesh weight (74.75, 75.25 and 75.00 g), flesh: seed ratio (9.36, 9.29 and 9.33), fruit length (3.88, 4.08 and 3.98 cm), fruit diameter (1.71, 1.72 and 1.72 cm), bunch weight (7.05, 7.38 and 7.21 kg) and yield (61.98, 63.71 and 62.84 kg/palm and 9.67, 9.94 and 9.80 t/ha) with minimum 10 seed weight (8.02, 8.16 and 8.09 g) and number of fruits drop per bag (26.57, 27.16 and 26.86) were noted with black colour polyethylene bag (B_3) during the year of 2022, 2023 and in pooled data, respectively.

That could be the cause of fruits are protected from UV radiation by black bagging, which also promotes growth, increases the accumulation of photosynthates, and increases fruit weight. The similar results were found by El-Assar and Refaat (2013) [7] in date palm. Covering of the bag with black colour provide microclimate to the fruit development and it helps to supply more food and water to the developing fruit. It increases flesh weight and more flesh: seed ratio with less seed weight. Similar results were found by Hossain *et al.* (2020) [13] in dragon fruit. Increasing fruit length and diameter, it could be the result of alterations in the microclimate, such as temperature regulation, moisture absorption, photosynthetically active radiation, and light interception within the bunch cover. Results corresponded to the findings of Mingire *et al.* (2017) [15] in mango. There is a positive association of temperature from shooting to harvest. It reduced the fruits drop per bag. The similar result was found by Kassem *et al.* (2011) [14], Harhas & Al-Obeed (2010) [12] in date palm. From the facts previously presented, it is also evident that bagging contributes to increased fruit weight, length, and circumference, all of which increase estimated yield. Similar finding was reported by Baraily and Deb (2022) [4] in pineapple.

Effect of plant growth regulators on yield parameters and yield of date palm

The effect of plant growth regulators influenced the yield attributes and yield of date palm presented in (Table 1, 2, 3 and 4). The yield parameters in terms of maximum number of fruits per strand (18.73, 19.26 and 18.99), 10 fruit weight (74.62, 74.75 and 74.68 g), 10 flesh weight (66.02, 66.35 and 66.19 g), flesh: seed ratio (7.84, 7.99 and 7.91), fruit length (3.87, 4.10 and 3.98 cm), fruit diameter (1.67, 1.68 and 1.67 cm) and bunch weight (6.96, 7.44 and 7.20 kg) with 10 seed weight (8.51, 8.40 and 8.45 g) noted with GA_3 150 mg/l (P_1) during the year of 2022, 2023 and in pooled data, respectively. Maximum yield (55.46, 58.03 and 56.75 kg/palm and 8.65, 9.05 and 8.85 t/ha) with minimum number of fruits drop per bag (26.37, 26.21 and 26.29) was found in the treatment of NAA 100 mg/l (P_2) during both the years 2022, 2023 and in pooled data, respectively.

Higher number of fruits per strand may be due to the maintenance of C: N ratio by gibberellic acid and it provides significant role in photosynthetic activity of plants and translocation of metabolites for the developing fruits in plants. The results were in close conformed with finding of Carpenter *et. al.* (2019) [5] in guava. The positive effect of gibberellic acid in fruit weight, flesh weight and flesh: seed ratio with minimum seed weight through increased mobilization of food reserves and accumulation of more pulp. (El-Salhy *et al*. 2017 and Choudhary *et al*. 2018) [10, 6]. It may be the consequence of a hormone that promotes the movement and accumulation of photosynthates and speeding up cell division, elongation, and enlargement in intercrystal gaps of mesocarpic cells. As a result of increases fruit length and diameter. NAA helps to faster metabolic activities of plant and production of carbohydrates and their translocation to various plant parts. It might be due to cumulative effect of bunch weight, fruit length and diameter and less fruit drop, which ultimately leads to a higher yield per palm and per hectare. The similar result was found by Al-Falahy and Hasan (2020) [1] in date palm. As auxin works to inhibit the action of the hydrolytic enzymes that breakdown the separation layer, namely cellulase and

pectinase, the decrease in fruit drops that results from spraying with NAA may be attributed to its role in preventing the formation of the separation layer by preventing the degradation of the cell walls and the middle plates of the cells of the abscission zone (El-Khayat, 2019) [8].

Table 1: Effect of bagging and plant growth regulators on number of fruits per strand, fruit weight and flesh weight of date palm

Treatments	Number of fruits per strand			10 fruit weight (g)			10 flesh weight (g)		
	2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
Bagging (B)									
B_0	16.93	17.62	17.28	62.25	62.62	62.44	52.76	53.41	53.09
B_1	18.99	19.14	19.06	75.47	75.73	75.60	67.04	67.41	67.23
B_2	17.98	18.46	18.22	68.42	68.93	68.68	59.54	60.16	59.85
B_3	19.76	20.18	19.97	82.77	83.16	82.96	74.75	75.25	75.00
S.Em±	0.16	0.16	0.12	0.86	0.85	0.61	0.92	1.02	0.69
C. D. (P=0.05)	0.47	0.47	0.33	2.48	2.45	1.71	2.65	2.94	1.94
Plant Growth Regulators (P)									
P_0	18.08	18.57	18.33	69.96	70.56	70.26	61.04	61.84	61.44
P_1	18.73	19.26	18.99	74.62	74.75	74.68	66.02	66.35	66.19
P_2	18.54	18.75	18.65	72.81	73.11	72.96	64.19	64.62	64.04
P_3	18.31	18.81	18.56	71.53	72.02	71.77	62.82	63.43	63.12
S.Em±	0.16	0.16	0.12	0.86	0.85	0.61	0.92	1.02	0.69
C. D. (P=0.05)	0.47	0.47	0.33	2.48	2.45	1.71	2.65	2.94	1.94
Year	-	-	S	-	-	NS	-	-	NS
B x P	NS	NS	NS	NS	NS	NS	NS	NS	NS
Y x B	-	-	NS	-	-	NS	-	-	NS
Y x P	-	-	NS	-	-	NS	-	-	NS
Y x B x P	-	-	NS	-	-	NS	-	-	NS
C.V. %	3.05	3.02	3.03	4.12	4.06	4.09	5.01	5.52	5.28

Table 2: Effect of bagging and plant growth regulators on flesh: seed ratio, fruit length and fruit diameter of date palm

Treatments	Flesh: seed ratio			Fruit length (cm)			Fruit diameter (cm)		
	2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
Bagging (B)									
B_0	5.66	5.80	5.73	3.38	3.58	3.48	1.40	1.41	1.41
B_1	7.96	8.11	8.03	3.70	3.98	3.84	1.61	1.61	1.61
B_2	6.70	6.86	6.78	3.54	3.77	3.66	1.50	1.51	1.50
B_3	9.36	9.29	9.33	3.88	4.08	3.98	1.71	1.72	1.72
S.Em±	0.12	0.10	0.08	0.07	0.07	0.05	0.03	0.03	0.02
C. D. (P=0.05)	0.35	0.28	0.22	0.20	0.21	0.15	0.09	0.09	0.06
Plant Growth Regulators (P)									
P_0	6.98	6.93	6.95	3.38	3.58	3.48	1.45	1.47	1.46
P_1	7.84	7.99	7.91	3.87	4.10	3.98	1.67	1.68	1.67
P_2	7.55	7.69	7.62	3.70	3.95	3.83	1.59	1.59	1.59
P_3	7.31	7.47	7.39	3.54	3.78	3.66	1.52	1.51	1.52
S.Em±	0.12	0.10	0.08	0.07	0.07	0.05	0.03	0.03	0.02
C. D. (P=0.05)	0.35	0.28	0.22	0.20	0.21	0.15	0.09	0.09	0.06
Year	-	-	NS	-	-	S	-	-	NS
B x P	NS	NS	NS	NS	NS	NS	NS	NS	NS
Y x B	-	-	NS	-	-	NS	-	-	NS
Y x P	-	-	NS	-	-	NS	-	-	NS
Y x B x P	-	-	NS	-	-	NS	-	-	NS
C.V. %	5.60	4.48	5.06	6.75	6.67	6.71	6.59	6.57	6.58

Table 3: Effect of bagging and plant growth regulators on bunch weight, yield (kg/palm) and yield (t/ha) of date palm

Treatments	Bunch weight (kg)			Yield (kg/palm)			Yield (t/ha)		
	2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
Bagging (B)									
B_0	6.35	6.74	6.54	48.01	49.51	48.76	7.49	7.72	7.61
B_1	6.87	7.20	7.04	53.56	55.42	54.49	8.36	8.65	8.50
B_2	6.63	6.97	6.80	51.76	53.04	52.40	8.07	8.28	8.17
B_3	7.05	7.38	7.21	61.98	63.71	62.84	9.67	9.94	9.80
S.Em±	0.11	0.11	0.08	0.73	0.79	0.54	0.11	0.12	0.08
C. D. (P=0.05)	0.33	0.33	0.23	2.11	2.26	1.52	0.33	0.35	0.24
Plant Growth Regulators (P)									
P_0	6.49	6.73	6.61	50.94	52.56	51.75	7.95	8.20	8.07
P_1	6.96	7.44	7.20	54.61	55.82	55.22	8.52	8.71	8.61
P_2	6.80	7.19	6.99	55.46	58.03	56.75	8.65	9.05	8.85
P_3	6.65	6.94	6.79	54.31	55.27	54.79	8.47	8.62	8.55
S.Em±	0.11	0.11	0.08	0.73	0.79	0.54	0.11	0.12	0.08
C. D. (P=0.05)	0.33	0.33	0.23	2.11	2.26	1.52	0.33	0.35	0.24
Year	-	-	S	-	-	S	-	-	S
B x P	NS	NS	NS	NS	NS	NS	NS	NS	NS
Y x B	-	-	NS	-	-	NS	-	-	NS
Y x P	-	-	NS	-	-	NS	-	-	NS
Y x B x P	-	-	NS	-	-	NS	-	-	NS
C.V. %	5.82	5.60	5.71	4.71	4.91	4.82	4.72	4.91	4.82

Table 4: Effect of bagging and plant growth regulators on seed weight and number of fruits drop per bag of date palm

Treatments	10 Seed weight (g)			Number of fruits drop per bag		
	2022	2023	Pooled	2022	2023	Pooled
B_0	9.32	9.21	9.27	31.34	31.21	31.28
B_1	8.43	8.32	8.37	28.55	28.64	28.59
B_2	8.89	8.77	8.83	30.36	30.16	30.26
B_3	8.02	8.16	8.09	26.57	27.16	26.86
S.Em±	0.13	0.13	0.09	0.50	0.51	0.36
C. D. (P=0.05)	0.36	0.36	0.25	1.45	1.45	1.01
P_0	8.83	8.97	8.90	31.15	31.24	31.19
P_1	8.51	8.40	8.45	28.93	29.56	29.25
P_2	8.61	8.50	8.55	26.37	26.21	26.29
P_3	8.71	8.59	8.65	30.36	30.16	30.26
S.Em±	0.13	0.13	0.09	0.50	0.51	0.36
C. D. (P=0.05)	NS	0.36	0.25	1.45	1.45	1.01
Year	-	-	NS	-	-	NS
B x P	NS	NS	NS	NS	NS	NS
Y x B	-	-	NS	-	-	NS
Y x P	-	-	NS	-	-	NS
Y x B x P	-	-	NS	-	-	NS
C.V. %	5.03	5.05	5.04	5.96	5.97	5.96

From the two years of experimental study, it can be concluded that bagging with black colour polyethylene bag gave maximum yield parameters and yield with minimum seed weight and fruits drop per bag. Similarly, plants treated with GA_3 150 mg/l gave maximum yield parameters with minimum seed weight. However, maximum yield with minimum fruits drop per bag was found with of NAA 100 mg/l.

Acknowledgement

I wish to convey my sincere gratefulness towards Dr. M. J. Patel (Major advisor) and to my advisory committee members for giving me proper guidance throughout the course of study.

References

1. Al-Falahy THR, Hasan AM. Impact of potassium sulphate and naphthalene acetic acid spray on yield and fruit quality of date palm cv. Barhee. Eurasia J Biosci. 2020;14:4689-4695.
2. Anonymous. Director of Horticulture. Agriculture, Farmer Welfare and Co-operation Department, Government of Gujarat. 2023.
3. Ashraf Z, Hamidi-Esfahani Z. Date and date processing: A review. Food Rev Int. 2011;27:101–133. doi: 10.1080/87559129.2010.535231.
4. Baraily P, Deb P. Response of pineapple yield and quality on pinching of crown leaves combined with bagging of fruits. Int J Plant Soil Sci. 2022;34(10):74-84.
5. Carpenter S, Jain MC, Singh J, Bhatnagar P, Arya CK. Effect of foliar spray of gibberellic acid and urea on yield and quality of guava (*Psidium guajava* L.) cv. L-49. Int J Chem Stud. 2019;7(1):205-207.
6. Choudhary SK, Kumar S, Meena R, Yadav PK, Sudarsan Y. Effect of GA3 on fruit yield and quality of date palm (*Phoenix dactylifera* L.). Int J Curr Microbiol App Sci. 2018;7(2):3448-3456.
7. El Assar AM, Refaat AA. The economics effect for some operating of fruit thinning and bunch covering

treatments on "Sewi cv." date palm productivity in Siwa Oasis. J Agric Econom Soc Sci Mansoura Univ. 2013;4(1):65-81.
8. El-Khayat HM. Effects of Aminoethoxyvinylglycine (AVG) and Naphthalene acetic acid (NAA) on pre-harvest fruit drop and quality of Washington navel orange. Middle East J Appl Sci. 2019;9(4):969-984.
9. El-Salhy AM. Effect of bagging the spathes on Zaghloul date production under Assiut conditions. Assiut J Agril Sci. 2000;31(3):123-134.
10. El-Salhy AM, Abou-Zaid EA, Diab YMS, Mohamed HAM. Effect of antioxidants, growth regulators and yeast spraying on fruiting of Seewy date palms. Assiut J Agric Sci. 2017;48(5):178-186.
11. Gomez AK, Gomez AA. Statistical procedures for agricultural research. John Wiley and Sons; 1976.
12. Harshash MM, Al-Obeed RS. Effect of bunch bagging color on yield and fruit quality of date palm. Am Eurasian J Agric Environ Sci. 2010;7(3):312-319.
13. Hossain MM. Postharvest quality and shelf life of dragon fruit (*Hylocereus* spp.) as influenced by preharvest fruit bagging materials. J Agric Food Environ. 2020;1(4):33-40.
14. Kassem HA, Omar AKH, Ahmed MA. Response of Zaghloul date palm productivity, ripening and quality to different polyethylene bagging treatments. J Agric Environ Sci. 2011;11:616-621.
15. Mingire SS, Haldankar PM, Parulekar YR, Kadam DS, Haldavanekar PC, Narangalkar AL, Dalvi VV, Khandekar RG. Studies on influence of preharvest bagging of fruits on quality of mango cv. Ratna. Indian J Hort. 2017;74(2):178-183.
16. Shah JJ. Date palm cultivation in India: An overview of activities. Emirates J Food Agric. 2014;987-999.