



EFFECT OF HIGH PLACES ON THE ACTIVITY OF HONEY BEE COLONIES IN MINIA GOVERNORATE

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ABSTRACT

This study was carried out in Al-Rawdah village, Mallawy district of Minia Governorate in the period from March to September in the two successive years of 2015, 2016. Fifteen colonies of equal strength, recent mated sister queens and equal stored food (honey and pollen) were used to study the effect of high places on the foraging activity of five colonies of honeybees through the counting of the workers going out of the hive and returning to it in the minute, throughout the day at 7:00 am, 9:00 am, 11:00 am, 3:00 pm and 5:00 pm in each of the three altitude levels 0, 8 and 11 m.

The results showed the following points: In the first season of 2015, the number of outgoing workers per minute for bee colonies at 11 m. was greater than the number of outgoing workers in the level of 0 m. and 8 m. at 7:00 am, 9:00 am and 11:00 am, while the number of outgoing workers per minute was great at 8 m. at 3:00 pm and at 5:00 pm the number of outgoing worker bees per minute was great at 0 m.

The number of returning workers to the hive was greater at the level of 11 m. at 7 am, 9 am and 3 pm and the number of returning workers was greater at the level of 0 m. at 11 am and 5 pm.

In the second season 2016 the number of outgoing and coming back foragers was higher at 0 m. than the other two levels in all the above-mentioned dates.

INTRODUCTION

Maintaining honey bee colonies in high places (rooftop hives) is not novel method to keep bees because wild bees and honey bee swarms prefer nests that are located at high places Seeley and Morse (1978). Wilson (1965) studied the effect of elevation on the honey bee colonies at Rocky Mountains and found that the queen's egg laying, brood development and pollen and nectar foraging were unaffected also swarming occurred. Dhaliwal and Sharma (1974) in the Himalaya mountains found that the foraging range of *Apis cerana* was reduced not because of the altitude, but in relation to the gradient of the land. Ruttner (1988) found that honeybees at higher altitudes in African mountains differed from lower surrounding populations in both size and pigmentation. Crane (1992) found that bee keeping is currently carried out in mountain regions at all technological level all over the world. Radloff and Hepburn (1999) found that bees become increasingly larger with increasing altitude and also the bees become lighter in color. These bees with large wings were reported to have higher flying ability than small ones Mostajeran *et al.* (2006). Mcneil(2009) said that presence of the honeybee colonies on the rooftop buildings provides cities with environmental and economic

benefits. Bees pollinate a wide variety of plants, and the honey they produce is often sold to local restaurants and in local shops. Rooftop apiaries are having many advantages over their country side apiaries; this protects from predators, the cold and humidity of the ground and reduces the spread of diseases between colonies Wilson (1965).

MATERIALS AND METHODS

The present study was carried out during spring and summer (March to September of 2015 and 2016) at Alrawd village, Mallawy district Minia Governorate. Three apiaries were located at different altitudes : The first was put on the ground (0 m), the second was put at roof top 8 m altitude and the third was put at roof top 11 m altitude.

1. Experimental Bees:

Fifteen Carniolan honeybee (*Apis mellifera carnica*) colonies having an approximately equal strength, headed by recent mated sister queens and equal stored food of honey and pollen were specified for recording foraging activity outgoing and coming back foragers which determined through counting the number of individuals going out and those going in to the hive entrance in one minute at 7:00am, 9:00 am,11:00am, 3:00pm and 5:00pm .Abou- Shaara *et al.*(2013).

2. Scientific axis of the study:

Studying the effect of high on foraging activity of honeybee colonies located at different high places.

3. Statistical analysis:

The experiment was set up according to a Randomized Complete Block Design (RCBD) containing three blocks with the treatments distributed randomly within these blocks. Analysis of variance (ANOVA) was performed. The means were compared using Duncan's multiple range test at significance level of 0.05. The correlations between factors were calculated using a Pearson correlation coefficient according to method of Mead *et al.*, (1993). The statistical analysis was performed with Costat 3.03 Program.

RESULTS AND DISCUSSION

Results obtained of the foraging bees reared in 0 – level hives were tabulated in Table (1) and illustrated in Figs (1-4) for the two seasons of 2015 and 2016.

The mean numbers of foraging bees which going out of hive /min. were recoded the greatest value at 11.00 am during March, April and May (spring season) which recorded 20.95, 21,30 and 18,60 bees/min., respectively in 2015. The same trend was noticed in 2016 giving 20.60, 21.40 and 24.20 bees/min. In June, July, August and September (summer season) the highest mean values were 12.20, 25.50, 28.60 and 20.03 in 2015

and 27.26, 33.05, 27.75 and 31.80 in 2016, respectively which were recorded at 9.00 am Expect June (11 am). This may be due to the presence of maize pollen in the morning. At 3.00 pm in July 2015, the highest mean of worker bees going out showed 31.20/min.

On the other hand, the highest mean numbers of returned bees /min. were recorded between 11.00 am and 3.00 pm in March, April and May. The number of foraging bees increased in the morning due to the availability of nectar in the flower while the values increased again in 3.00 pm due to increase of sugar concentration in the nectar as a result of increasing air temperature. In June, July, August and September data in Table (1) revealed that the highest values were recorded between 9.00 am and 5:00 pm because maize was the main pollen source in the mentioned period and the pollen was available in large quantities at that time Eshbah (1986).

Table (2) and Figs (1-4) showed the mean numbers of foraging bees which going out and coming in the hives at 8 m. altitude in 2015 and 2016 season.

The greatest mean numbers were, 16.80, 26.40 and 24.30 in March, April and May 2015, at 11.00 am and 20.40, 24.80 and 15.70 bees/min. in June, August and September at 9.00 am while it recorded 29.40 bees/min. in July 2015 at 3.00 pm. It worth mentioning that the mean numbers in the studied months of 2015 were higher at 8 m. high

than 0- level. In 2016 season, the maximum mean value of bees was lower at 8-m. high comparing with the 0- level.

The mean numbers of returned bees/min. in 2015 were the highest at 3.00 pm in March, April, June, July and August which recorded 22.00, 29.20, 33.70, 24.50, 33.00 and 20.70 bees /min. at 3.00 pm. In September, it showed 16.50 bees/min. at 9.00 am. In 2016, the values showed 14.80, 14.50 and 15.13 at 3.00 pm of March, May and June. While they were 16.20, 17.25 and 16.40 bees/min. at 9.00 am in July, August and September. In April 2016, it showed a mean of 12.00 bees/min. at 11.00 am It was noticed that the values were lower in 2016 than in 2015 season. This may be due to that bees nuisance the neighbors in the surround areas so that they try to fight them. So, many urban areas now regulate beekeeping in for example Ontario prohibited of keeping bees within 30 meters of a property line Berquist *et al.*, (2013).

Honeybee colonies located at 11m.altitude showed the greatest monthly mean numbers of foragers which going out and coming in the hives. In 2015 they were 21.78, 32.50, 28.70 and 27.20 in March, April, May and June which recorded at 11.00 am Except May (3.00 pm). In July, August, and September, the numbers of going out bees were

lower than that in the hives located at 0 m. and 8 m.. Date in 2016 revealed lower number generally. The mean numbers of returned bees in 2015 were the highest at 11 m. high which recorded at 3.00 pm in March, May, June and July 17.60, 34.50, 49.00 and 28.50, but in April the greatest value was recorded at 11.00 am 23.80 bees/min. the other values for August and September were higher in colonies at 0 m..

Table (4) showed that in 2015 there were no significant differences between the mean numbers of going out bees from the hives located at 0- level and that at upper places (8m.and 11m.) in March, July and August, while they were the highest in April, May and June at the upper places with significant differences. The 0- level came in the first rank significantly in September. In 2016, the mean numbers of going out bees in March, April and July in the different studied places were in significant, while the high places showed significant difference in May and June. On the other hand the means of going out bees from hives at 0- level showed the highest significantly in August and September.

Generally, the mean numbers of returned bees in the two seasons of the study were significantly higher for the hives located at 0- level comparing with the higher places.

Table (1): Foraging activity of honey bee colonies located on ground (0- level) in 2015 and 2016 seasons.

Time Month		Mean number of foraging bee workers (going out) /min.					Mean number of return bee workers /min.						
		7.00a.m.	9.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day	7.00a.m.	9.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day
March	2015	9.35	15.75	20.95	12.90	8.13	13.40	5.95	16.20	23.70	19.90	13.15	15.78
	2016	7.70	16.30	20.60	20.00	11.06	15.13	3.30	15.40	26.20	29.60	17.50	18.40
April	2015	11.00	15.20	21.30	5.80	5.20	11.70	8.60	17.00	21.20	10.20	8.80	13.16
	2016	8.80	19.00	21.40	17.35	9.85	15.28	9.20	20.00	27.40	28.00	16.20	20.16
May	2015	8.30	11.00	18.60	18.70	11.70	13.66	6.70	11.70	19.20	21.00	17.70	15.26
	2016	10.60	20.20	24.20	23.30	15.50	18.76	11.40	22.15	26.65	37.75	21.73	23.93
June	2015	6.20	12.20	10.00	11.40	7.40	9.44	6.00	13.20	9.60	22.20	19.00	14.00
	2016	23.06	26.60	27.26	22.46	17.73	23.42	26.13	29.53	31.00	26.26	31.26	28.83
July	2015	7.80	25.50	18.90	31.20	15.50	19.78	8.90	27.70	28.00	29.00	24.00	23.52
	2016	28.15	33.05	31.00	24.25	23.05	27.90	26.90	41.10	32.85	33.10	34.65	33.72
August	2015	8.60	28.60	16.40	27.30	14.90	19.16	12.60	30.00	31.00	33.80	21.30	25.74
	2016	26.20	27.75	21.85	18.40	16.65	22.17	21.95	33.60	23.65	25.26	22.25	25.34
September	2015	16.55	20.03	15.95	12.95	11.55	15.46	13.15	23.25	22.75	16.70	14.20	18.01
	2016	21.20	31.80	17.55	12.85	12.05	19.09	13.70	29.55	21.55	18.85	14.30	19.58
Mean of season	2015	9.68	18.32	17.44	17.17	10.62	14.64	8.84	19.86	22.20	21.82	16.87	17.91
	2016	17.95	24.95	23.40	19.80	15.12	20.24	16.08	27.33	27.04	28.40	22.55	24.28

Table (2): Foraging activity of honey bee colonies located in 8 m. altitude in 2015 and 2016 seasons.

Time Month		Mean number of foraging bee workers(going out) /min.						Mean number of return bee workers /min.					
		7.00a.m.	9.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day	00a.m.	.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day
March	2015	9.30	15.70	16.80	14.60	3.30	11.94	6.80	16.40	18.65	22.00	4.60	13.69
	2016	1.20	7.60	7.20	10.20	4.40	6.12	1.60	6.60	9.30	14.80	6.60	7.78
April	2015	17.40	23.80	26.40	19.00	2.20	17.76	12.00	26.20	28.00	29.20	2.60	19.60
	2016	4.45	9.60	9.70	10.30	7.50	8.31	4.30	9.15	12.00	11.90	11.15	9.70
May	2015	11.10	21.00	24.30	22.00	12.20	18.12	8.50	20.00	26.40	33.70	17.00	21.12
	2016	4.80	7.50	12.15	13.60	12.06	10.02	3.55	5.95	10.90	14.50	9.35	8.85
June	2015	11.40	20.40	19.40	17.80	13.00	16.40	14.70	18.90	20.50	24.50	16.90	19.10
	2016	11.93	22.06	13.60	12.80	13.00	14.67	11.26	13.00	13.26	15.13	16.93	13.91
July	2015	10.50	26.00	27.00	29.40	16.50	21.88	10.70	23.30	31.00	33.00	24.00	24.40
	2016	14.20	16.70	14.25	10.60	11.45	13.44	14.30	16.20	14.75	13.25	15.65	14.83
August	2015	12.90	24.80	22.60	21.40	14.40	19.22	9.40	24.40	19.00	20.70	20.00	18.70
	2016	14.30	15.00	7.30	8.95	8.75	10.85	13.50	17.25	7.55	11.10	12.90	12.46
September	2015	10.55	15.70	7.60	7.30	6.75	9.58	6.95	16.50	10.00	9.10	8.65	10.24
	2016	9.45	14.05	3.10	6.45	5.85	7.78	7.35	16.40	8.10	8.70	6.00	9.31
Mean of season	2015	11.87	21.05	20.58	18.78	9.76	16.40	9.86	20.81	21.93	24.60	13.39	18.11
	2016	8.61	13.21	9.61	10.41	9.00	10.17	7.98	12.07	10.83	12.76	11.22	10.97

Table (3): Foraging activity of honey bee colonies in 11 m. altitude in 2015 and 2016 seasons.

Time Month		Mean number of foraging bee workers(outgoing) /min.						Mean number of return bee workers /min.					
		7.00a.m.	9.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day	7.00a.m.	9.00a.m.	11.00a.m.	3.00p.m.	5.00p.m.	Mean of day
March	2015	12.63	16.40	21.78	9.35	5.65	13.16	10.75	15.60	17.10	17.60	7.05	13.62
	2016	4.06	7.20	11.06	10.80	6.60	7.94	4.20	9.30	10.40	13.50	9.80	9.44
April	2015	21.20	25.60	32.50	7.90	4.70	18.38	17.30	21.90	23.80	21.70	4.30	17.80
	2016	3.60	5.40	6.30	9.85	6.15	6.26	4.15	5.30	6.35	11.45	8.50	7.15
May	2015	10.40	22.80	22.00	28.70	11.80	19.14	11.20	17.00	20.80	34.50	18.80	20.46
	2016	2.90	8.85	13.45	17.35	11.20	10.75	4.25	11.10	13.95	19.85	15.73	12.97
June	2015	11.50	26.80	27.20	23.40	14.70	20.70	13.50	27.30	27.30	49.00	23.50	28.12
	2016	8.66	14.53	15.60	15.06	14.60	13.69	13.86	14.93	20.06	24.06	22.00	18.98
July	2015	10.40	27.90	29.00	29.00	18.30	23.00	8.20	27.00	31.00	28.50	21.40	23.22
	2016	15.00	18.35	11.95	14.00	18.00	15.46	21.20	22.20	15.60	15.95	23.30	19.65
August	2015	10.90	26.00	19.00	24.20	12.20	18.46	9.70	21.60	21.30	25.00	19.60	19.44
	2016	16.10	17.70	7.80	17.15	11.20	13.99	17.05	22.05	13.25	20.80	15.65	17.76
September	2015	7.70	16.35	5.65	6.40	6.80	8.58	9.35	23.05	8.95	9.05	10.10	12.10
	2016	11.60	18.15	3.65	6.10	5.25	8.95	15.20	24.70	6.60	9.50	7.35	12.67
Mean of season	2015	12.10	23.12	22.44	18.42	10.59	17.33	11.42	21.92	21.46	26.47	14.96	19.24
	2016	8.84	12.88	9.97	12.90	10.42	11.00	11.41	15.65	12.31	16.44	14.61	14.08

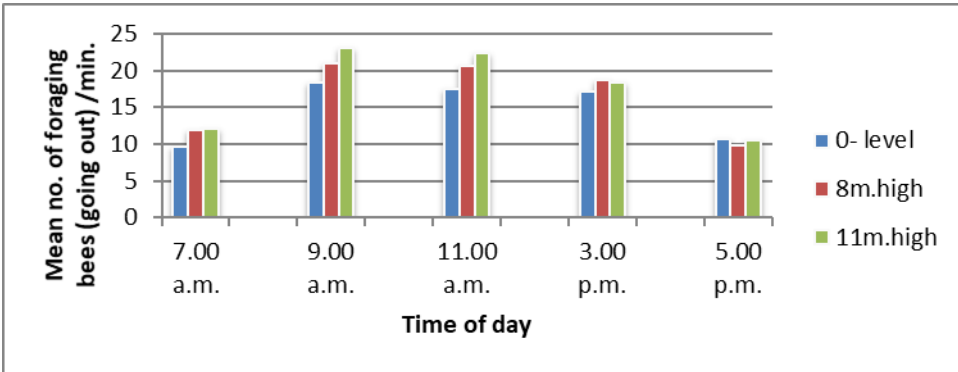


Fig (1): Seasonal mean numbers of foraging bees (going out) at three levels of altitude in 2015 season.

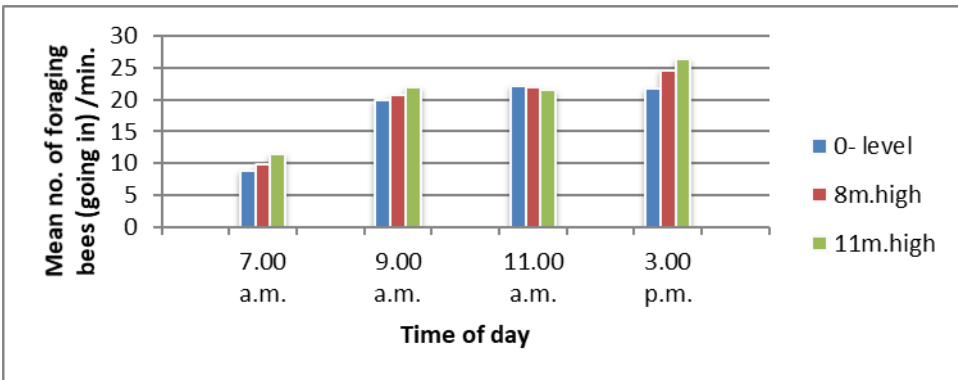


Fig (2): Seasonal mean numbers of foraging bees (going in) at three levels of altitude in 2015 season.

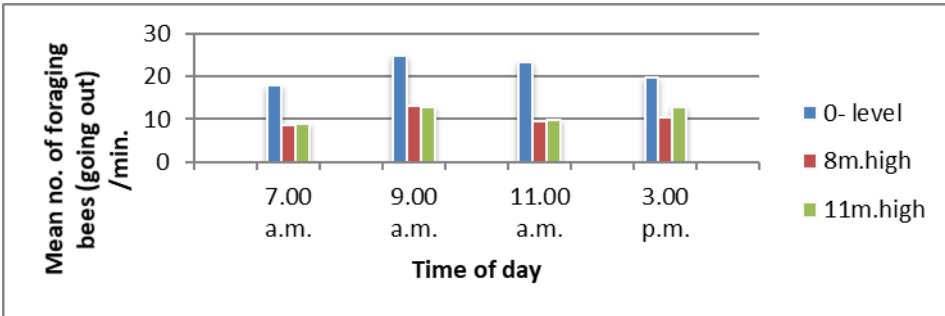


Fig (3): Seasonal mean numbers of foraging bees (going out) at three levels of altitude in 2016 season.

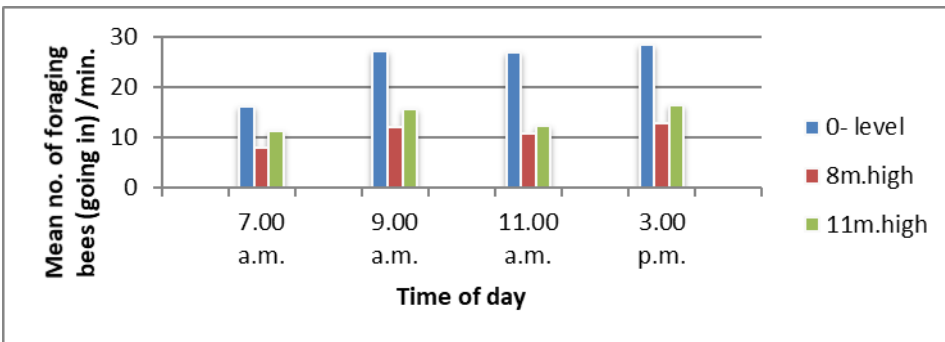


Fig (4): Seasonal mean numbers of foraging bees (going in) at three levels of altitude in 2016 season.

Table (4): Statistical analysis of the Foraging activity of honey bee colonies located at 0- level and high places in 2015 and 2016 seasons.

Time Month		Daily mean number of going out bees /min.		Daily mean number of going in bees /min.	
		2015	2016	2015	2016
March	0 m. (control)	13.40 a *	15.13 a	15.78 a	18.40 a
	8 m. high	11.94 a	6.12 b	13.69 a	7.78 b
	11 m. high	13.16 a	7.94 b	13.62 a	9.44 b
April	0 m. (control)	11.70 b	15.28 a	13.16 a	20.16 a
	8 m. high	17.76 ab	8.31 b	19.60 a	9.70 b
	11 m. high	18.38 a	6.26 b	17.80 a	7.15 b
May	0 m. (control)	13.66 b	18.76 a	15.26 b	23.93 a
	8 m. high	18.12 a	10.02 b	21.12 a	8.85 b
	11 m. high	19.14 a	10.75 b	20.46 a	12.97 b
June	0 m. (control)	9.44 c	23.42 a	14.00 b	28.83 a
	8 m. high	16.40 b	14.67 b	19.10 b	13.91 c
	11 m. high	20.70 a	13.69 b	28.12 a	18.98 b
July	0 m. (control)	19.78 a	27.90 a	23.52 a	33.72 a
	8 m. high	21.88 a	13.44 b	24.40 a	14.83 c
	11 m. high	23.00 a	15.46 b	23.22 a	19.65 b
August	0 m. (control)	19.16 a	22.17 a	25.74 a	25.34 a
	8 m. high	19.22 a	10.85 b	18.70 b	12.46 c
	11 m. high	18.46 a	13.99 b	19.44 b	17.76 b
September	0 m. (control)	15.46 a	19.09 a	18.01 a	19.58 a
	8 m. high	9.58 b	7.78 b	10.24 b	9.31 b
	11 m. high	8.58 b	8.95 b	12.10 b	12.67 b
Mean of season	0 m. (control)	14.64 b	20.24 a	17.91 a	24.28 a
	8 m. high	16.40 a	10.17 b	18.11 a	10.97 b
	11 m. high	17.33 a	11.00 b	19.24 a	14.08 b

* Means followed by the same letters in each column are not significantly different at 5% level of probability (Duncan multiple range test).

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تأثير الأماكن المرتفعة على نشاط طوائف نحل العسل في محافظة المنيا

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أُجريت هذه الدراسة في قرية الروضة، مركز ملوي، محافظة المنيا خلال الفترة من مارس إلى سبتمبر في كل من موسمي 2015 و2016 م حيث استخدمت طوائف نحل عسل متساوية في القوة من سلالة الهجين الأول كرنيولى ويغطى النحل 5 أقراص في بداية الدراسة، وعلى رأس الطوائف ملكات أخوات ملقحات، وكذلك مخزون متساوي من العسل وحبوب اللقاح.

لدراسة تأثير الارتفاع على نشاط سروح الشغالات خمس طوائف من نحل العسل على ارتفاعات المستوي الأرضي 0 متر ومستوى 8 متر ومستوى 11 متر وتم عد الشغالات الخارجة من الخلية والعائدة إليها في الدقيقة، على مدار النهار الساعة السابعة والتاسعة والحادية عشر صباحاً والثالثة عصرًا والخامسة مساءً في كل من الثلاث ارتفاعات.

أوضحت نتائج الموسم الأول 2015 م أن عدد الشغالات الخارجة من الخلية في الدقيقة من طوائف النحل الموجودة في مستوى 11 متر كانت أكبر من عدد الشغالات الخارجة من كل من طوائف النحل الموجودة على مستوى الأرض (0 متر) ومستوى 8 متر في الساعة السابعة صباحاً و التاسعة صباحاً والحادية عشر صباحاً وأما الساعة الثالثة عصرًا فكان عدد الشغالات الخارجة من الخلية أكبر في مستوى 8 متر والخامسة مساءً كان عدد الشغالات الخارجة أكبر في مستوى 0 متر ، أما عدد الشغالات العائدة إلى الخلية فكانت أكبر في مستوى 11 متر في الساعة السابعة صباحاً والتاسعة صباحاً والثالثة عصرًا وكان عدد الشغالات العائدة أكبر الساعة الحادية عشر صباحاً والخامسة مساءً في مستوى 0 متر

في الموسم الثاني 2016 م كان عدد الشغالات الخارجة من الخلية والعائدة إلى الخلية أعلى في مستوى 0 متر عن المستويين الآخرين في كل المواعيد السابقة الذكر.