

# Assessing the Efficiency of Sponge and Traditional Methods of Pollination in Date Palm

Abdallah Ben Abdallah<sup>1,2</sup>, Nabeel Ali Al-Wusaibai<sup>1</sup> and Youssef Al-Fehaid<sup>1</sup>

1. Date Palm Research Centre, Al-Hassa 31982, Saudi Arabia

2. FAO Project (UTFN/SAU/043/SAU), DPRC, Al-Hassa 31982, Saudi Arabia

Received: February 13, 2014 / Published: April 20, 2014.

**Abstract:** In date palm *Phoenix dactylifera* L. male (pollen bearing) and female (fruit bearing) inflorescences are on separate palms. To ensure good fertilization and better yield, artificial pollination is carried out in date plantations, where pollen harvested from male flowers are used for artificial pollination which is usually done manually. Often, the availability of male flowers becomes scarce due to the high demand to take up pollination during the short period of time when the female flowers are receptive. We assessed the comparative efficiency of using pollen to manually pollinate female date palm flowers in the field using sponge pieces charged with harvested pollen as compared to the traditional practice of the farmers using male inflorescences. Results revealed that fruit set (%), fructification (%), yield per bunch (kg) besides fruit weight, length and breadth were statistically similar in the two pollination methods evaluated. The sponge method of manual pollination can therefore serve as a viable alternative to the traditional method of pollination with the possibility of using stored pollen especially where male palms are scarce and pollen is difficult to obtain.

**Key words:** Date palm, manual pollination, sponge technique, fruit set, fructification.

## 1. Introduction

Date palm *Phoenix dactylifera* L. is the most important fruit crop in the Arabian Peninsula, closely associated with the life of the people in the region since ancient times. The date industry is rapidly growing at the Arabian Peninsula. According to the Food and Agriculture Organization (FAO) of the United Nations, the global date production has increased from just 1.8 million tons in 1962 to 7 million tons in 2010. The Kingdom of Saudi Arabia is among the world's leading producer of dates producing 1.3 million tones of dates annually, accounting for 17% of the global date production [1].

Date palm is a dioecious crop where male (pollen bearing) and female (fruit bearing) inflorescences are on separate palms [2]. To ensure good fertilization, traditionally female inflorescence is usually manually

pollinated by inserting male flowers between female flower clusters during the first few days of its opening when the female flowers are receptive [3]. This overcomes disadvantages of dichogamy besides enhancing fruit set and sustaining yield levels.

The most common manual technique of pollination in date palm is to cut the strands of male flowers from a freshly opened male spathe and place two to three of these strands, lengthwise and in an inverted position, between the strands of the female inflorescence [4]. Mechanical pollination in date palm using pollen dusters is also known since late 1960s [5] but not common among farmers.

Often the availability of male flowers becomes scarce due to the high demand to take up pollination during the short period of time when the female flowers are receptive. Pollen can therefore be stored and used to pollinate female flowers [5] when required without depending on the availability of strands of male flowers during the season. Efficiency of pollen is

---

**Corresponding author:** Abdallah Ben Abdallah, Ph.D., research field: date palm production and protection. E-mail: abdallah.benabdallah@fao.org.

also known to increase when mixed with wheat flour [5]. Although sponge pieces charged with date pollen have been used to manually pollinate female inflorescences in date palm [6], there is no data to quantify its impact in terms of fruit set and subsequent yield. During 2013, studies were carried out in the date palm oasis of Al-Hassa (25°19'60" N latitude and 49°37'60" E longitude) in Saudi Arabia to assess the efficiency of the sponge and traditional techniques of manual pollination in date palm.

## 2. Materials and Methods

Field studies were conducted by the Date Palm Research Centre, Al-Hassa during 2013 to test the efficiency of two pollination techniques (sponge and traditional). The trial was carried out in Wuziah village in the Al-Hassa oasis. Two blocks (Table 1) of date palms (Khalas cultivar) were pollinated using the sponge technique (T1) where in strips of sponge (25 cm long, 1.5 cm thick and 3 cm wide) charged with freshly extracted date pollen mixed with wheat flour in the ratio of 1:4 were used to pollinate the female inflorescence by inserting 1-3 pollen charged sponge pieces between female inflorescences. In another two blocks of the same plantation, pollination was carried out using the traditional method (T2) of pollination practiced by farmers where in 2-3 male flower strands (staminate inflorescences) harvested from male date palms were placed between female flower clusters. The number of pollen charged sponge pieces and male flower strands used for pollination depended on the size of the female inflorescences. To ensure fertilization and good fruit set, in both T1 and T2 the female inflorescences were loosely tied with twine to secure the pollen charged sponge pieces and male

flower strands within the female flowers. Pollination was carried out during February 2013 by using pollen (T1) and male flowers (T2) from the same male date palms.

Five palms were marked in each experimental block (10 palms/treatment) to record observations on fruit set and fructification. Observations on fruit set in each of the five sample palms were recorded at the khalal fruit stage in three bunches (five strands/bunch). As regards fructification, observations in each of the five sample palms were recorded at the tamar stage in four bunches (five strands/bunch) on the following parameters: (1) fructification (%) and (2) yield per bunch (kg).

The physical characters of fruits (weight and size: length & width) were also recorded at the tamar stage in 100 fruits per palm. Data on all the above parameters were subjected to two sample *T* test ( $P = 0.05$ ). Results on the above parameters with respect to the sponge and traditional methods of pollination are presented and discussed below.

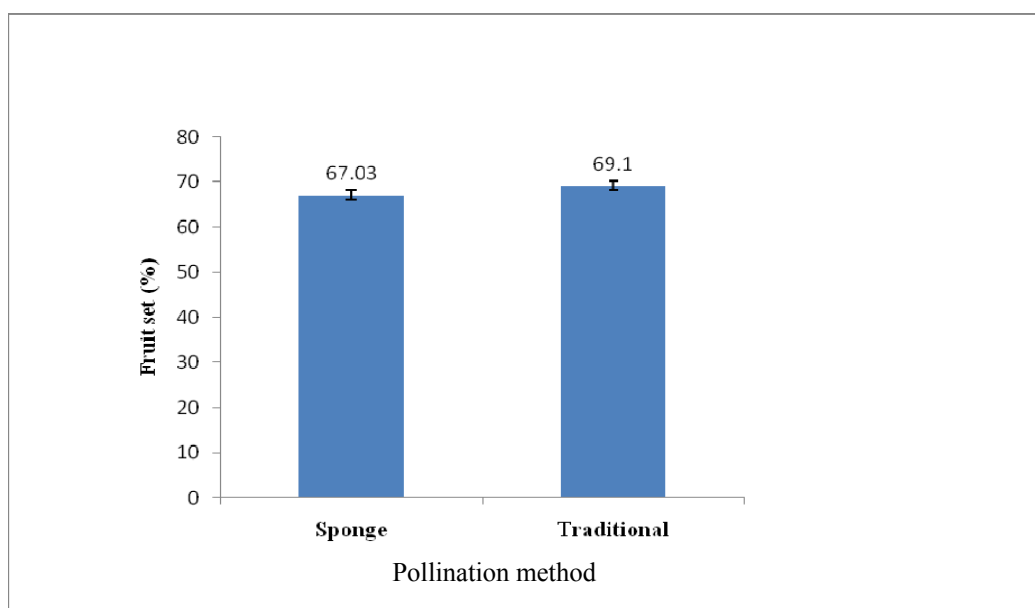
## 3. Results and Discussion

Results revealed that fruit set (%) at the khalal fruit stage in both T1 (sponge) and T2 (traditional) were 67.03 and 69.10, respectively and statistically similar (Fig. 1). Results on fructification (%) (56.95 and 54.48, respectively) and yield per bunch (7.32 kg and 6.31 kg, respectively) at the tamar stage were also statistically similar (Figs. 2 and 3). Further, fruit weight (9.54 g and 9.05 g, respectively), width (20.51 mm and 20.70 mm, respectively) and length (39.91 mm and 36.85 mm, respectively) were also similar in the two pollination methods (Figs. 4-6).

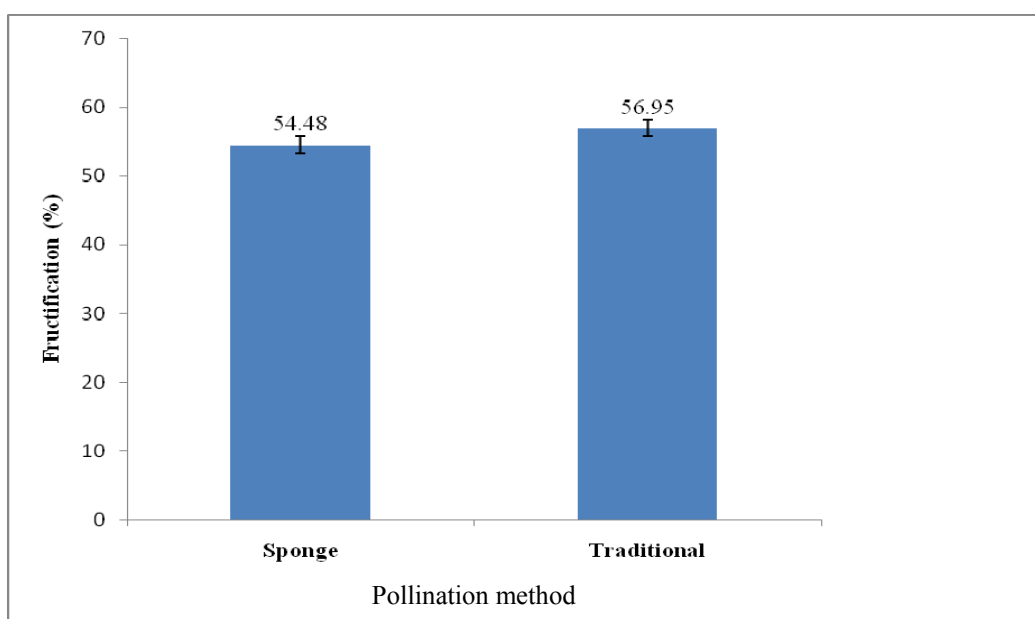
Timely pollination when the female flowers are most receptive is crucial to sustain yield levels in date palm. Delaying pollination beyond the seventh day of spathe cracking in Egypt resulted in significant reduction in initial fruit set and bunch weight [7]. It is recommended [8] that the stored pollen first be tested for viability then mixed with filler (e.g., wheat flower,

**Table 1** Number of palms per block in the two methods of pollination evaluated.

Treatment	Total palms/block
T1 (sponge method)	116
	119
T2 (traditional method)	89
	122



**Fig. 1** Effect of pollination method on fruit set in date palm (Khalas cv).



**Fig. 2** Effect of pollination method on fructification in date palm (Khalas cv).

industrialized-non perfumed talc, etc.). The mixture must be prepared immediately before pollination. In Pakistan a comparison between different methods of pollinating date palm viz. dusting of pollens, placement of male spathe, liquid spraying of pollens as well as natural process of pollination (control), revealed that highest fruit set was recorded in the placement method [9] which corresponds to the traditional method in this study. Reports from Saudi

Arabia reveal that manual method of pollination resulted in better fruit set as compared to mechanical pollination in the cultivar Khalas [10]. Our results showed that with regard to fruit set, fructification and other parameters evaluated placing male flower strands in female inflorescences (traditional method) did not significantly differ from the sponge technique in these manual two methods of pollination.

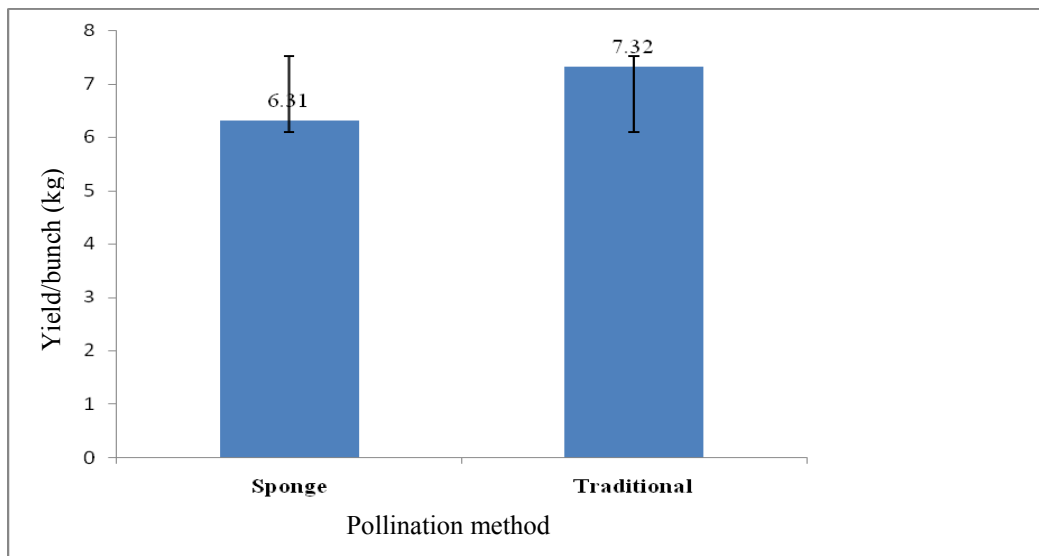


Fig. 3 Effect of pollination method on yield/bunch in date palm (Khalas cv).

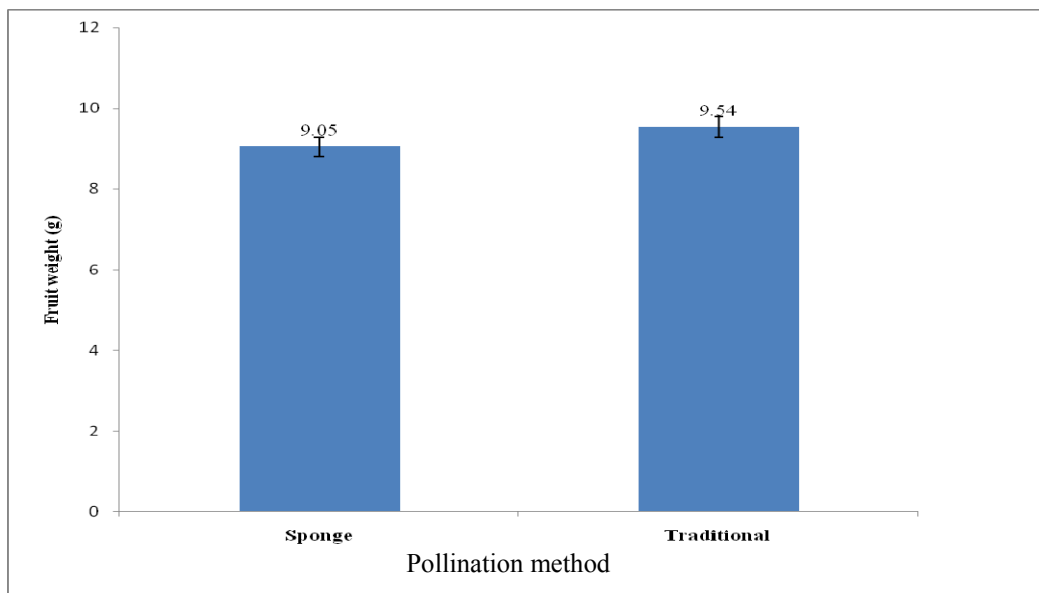


Fig. 4 Effect of pollination method on fruit weight in date palm.

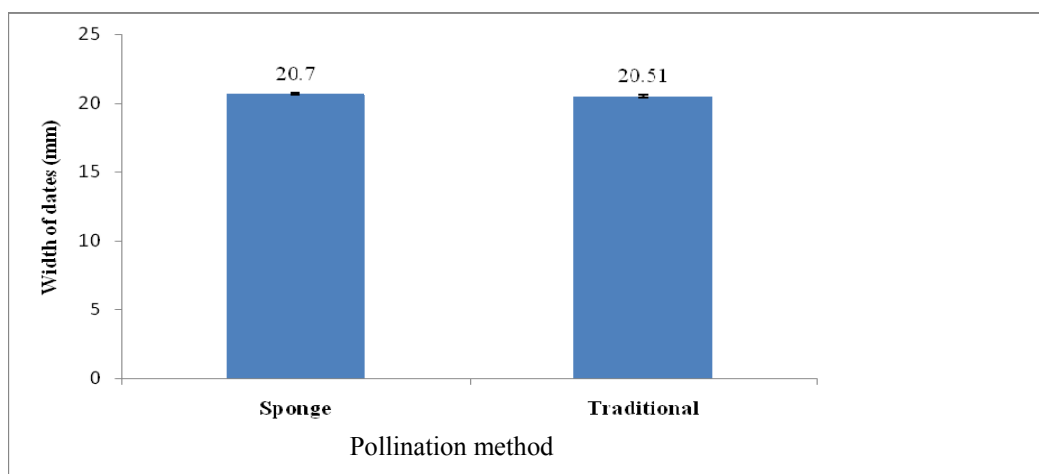


Fig. 5 Effect of pollination method on fruit width in date palm.

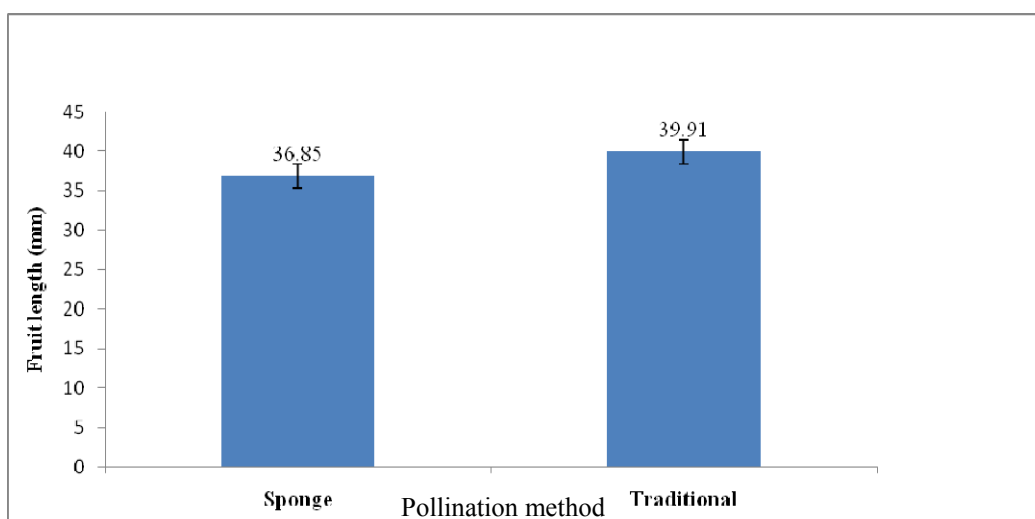


Fig. 6 Effect of pollination method on fruit length in date palm.

#### 4. Conclusions

Based on the results presented above, it is concluded that there is no difference between the sponge and traditional methods of pollination in terms of fruit set, yield and fruit attributes tested in date palm. Therefore, the sponge method of pollination can serve as a viable alternative to the traditional method of pollination especially where male palms are scarce and pollen is difficult to obtain.

#### Acknowledgments

Support provided by the Date Palm Research Centre, Al Hassa, Saudi Arabia to carry out this study through the FAO project UTFN/SAU/043/SAU is acknowledged.

#### References

- [1] Food and Agriculture Organization of the UN (FAOSTAT), 2012, <http://faostat.fao.org> (accessed Jan. 15, 2014).
- [2] P. Popenoe, The pollination of the date palm, *J. American Ori. Soc.* 42 (1992) 343-354.
- [3] W.N. Sawaya, Chapter I: Overview—Dates of Saudi Arabia, in: W.N. Sawaya (Ed.), *Dates of Saudi Arabia*, 1986, pp. 1-44.
- [4] V.H.W. Dowson, *Date Production and Protection: With Special Reference to North Africa and the Near East*, Food and Agriculture Organization of the United Nations, 1982, p. 294.
- [5] J.B. Carpenter, Improvement of traditional date culture, *The Date Palm J.* 1 (1) (1981) 1-17.
- [6] A.B. Abdallah, P.F. de Wet, Date palm pollination, production manual for date palm *Phoenix dactylifera* L. in Namibia: FAO project UTFN/NAM/004/NAM, Phase 2 (2006) 16.
- [7] A. El-Salhy, H.A. Abdel-Galil, M.M. El-Akkad, Y.M. Diyab, Effect of delaying pollination on yield and fruit quality of Sewy date palm under new valley conditions in Egypt, *Res. J. Agric. and Biol. Sci.* 7 (6) (2011) 408-412.
- [8] H.A. Hamood, J.S. Shalash, Effect of storage periods of pollination mixture on fruit set and fruit quality on date palm (*Phoenix dactylifera* L.) Khastawy cultivar, *Date Palm J.* 5 (1) (1987) 23-37.
- [9] I. Muhammad, Q.A. Muhammad, M. Muhammad, U.R. Saif, U.R. Habib, M. Niamatullah, Effect of different pollination techniques on fruit set, pomological characters and yield of Dhakki date palm (*Phoenix dactylifera* L.) in Dera Ismail Khan KP, *Sarhad J. Agric.* 26 (4) (2010) 515-518.
- [10] N.A. Al-Wusaibai, A.B. Abdallah, M.S. Al-Husainai, H. Al-Salman, M. Elballaj, A comparative study between mechanical and manual pollination in two premier Saudi Arabian date palm cultivars, *Indian J. Sci. Tech.* 5 (4) (2012) 2487-2490.