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COMPARATIVE STUDY OF MODIFIED POLLINATOR: A MECHANICAL TOOL FOR THE ACCELERATED POLLINATION WORK IN THE DATE PALM ORCHARD

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ABSTRACT

Date palm (*Phoenix dactylifera* L.) is a dioecious plant. Natural pollination in it does not meet the requirements of commercial fruit production. Therefore, artificial pollination is needed but prevalent methods of pollination are laborious and time consuming. The modified pollinator, developed from the initially made pollinator at Date palm research sub-station, Jhang, has been used in the study. Initially, its length and weight did not serve the purpose efficiently. During, 2003-2004, the updated pollinator has been used which is lighter in weight, easy to operate and can pollinate even taller trees, i.e., from 30 to 32 feet. It has not only saved labor charges but also over come the wastage of pollen, during the process. Fruit set percentage was maximum in case of mechanical pollination than the conventional method of keeping strands in the female spathes. Whereas, the results of natural pollination remained almost un-productive.

Keywords: Modified pollinator, puffer, valves, dusting capacity, economic reduction and minimal labor.

INTRODUCTION

Pakistan is the 5th biggest date producer of the world contributing 10.13% in the world date fruit production. Pakistan has an estimated total area of 734.6 thousand hectares under all fruits with a total production of 5712.4 thousand tones, annually (Anonymous, 2003-04) in which date shares about 7.47% by production and 10.18% by acreage. The province of Baluchistan plays the major role in date fruit production in Pakistan (56.55% by area and 52.69% by production) followed by Sindh, Punjab and NWFP. Date palm (*Phoenix dactylifera*) tree is dioecious in nature. It bears male and female flowers on separate plants and the pollination of female flowers is neither caused by wind nor by insects. Generally, one male tree is enough to provide pollen for ten female trees but natural pollinate on is not possible enough to meet the commercial requirements of fruit production. Therefore, the manual or mechanical pollination is being done in the main date growing areas of the world.

The most common method prevalent since times immemorial is to cut 6-8 strands of male flowers from the freshly opened inflorescence and placing them inverted, between the strands of female flower clusters. It is called "Artificial Pollination". Though it ensures moderately commercial fruit production if done well in time but this method is very difficult, cumbersome

and laborious because it requires more time and lot of skilled labor to climb up and down the date trees for placing male strands in the female flower clusters again and again. The fruit production in dates is based on the intensity and extent of the pollination work completed in the orchard i.e., within 2-4 days after splitting of the female spathes. In big orchards, it further becomes difficult to complete the pollination of the whole date plantation in time, i.e., within the short period, required for pollination from spathe opening to stigma receptivity. These conditions paved the way towards the need to modify the pollinator.

MATERIAL AND METHODS:

The female date palm tree bears 8-14 spathes under local conditions, emerging at various times, within a period of 6 to 7 weeks. The female spathes are ready to accept pollen for their pollination and fertilization just after their splitting and up to 2-4 days. At that time one has to climb up and down the date palm tree at least 5-6 times for this purpose. This seems not only practicable in large date palm groves but also comparatively least effective. Therefore, the comparative study of three methods was required to be made, i.e., pollination with Pollinator, manual pollination and pollination to be done naturally. In order to facilitate the pollination work, a mechanical Pollinator, developed at Govt. Date Research Farm, Jhang-Pakistan has been used in the study. It has 3-adjustable fine hollow rods with one iron hook at the top. A rubber or plastic pipe is attached at its one end to the iron hook and the other to the puffer with a pollen container in between them. It serves the purpose of pollination in the date plantation/ trees having height of 30 to 32 feet. This developed device is being used in this study to see its advantages over the others. Moreover, it is easy to operate.

This modified pollinator has gone in different stages of its developments from time to time. In the beginning a straight bamboo 20-22 feet in length was being used which has been replaced by steel hollow rods, as shown in figure. It is light weight and could be used with easy control but by the skilled labor. Specification of the developed date Pollinator is being mentioned in table-1.

RESULTS AND DISCUSSION

The working efficiency of the developed date Pollinator, evaluated, has shown its superiority over others, manifold. The manual pollination, involving climbing up the tree, each time, with looped rope around the waist, could hardly manage to cover 40-50 trees per day/ person, up to the same height of trees. Whereas, the pollinator has facilitated the work and proved to cover 200-225 trees up to a height of 30-32 feet, in a day during the high peak of working days. Economically, it further helped to save almost 75% labor charges. Moreover, this device avoids the wastage of pollens i.e. one plastic bottle of 250 ml can effectively supply pollen to 2500-3000 spathes, varying according to the size of the spathe. Dried and moisture- free pollen are used. Zaid and De Wet (1999) described the sufficiency of one gram of dried pollen for pollination of 10 female spathes. Similarly, the labor reduction of 50-70% has been reported by Ghaleb *et al.* (1987) by using various hand pollinators. The overlapping of pollination yield more reliable results than full palm pollination at one time (Nixon and Carpanter, 1978). Hamood and Mawlood (1986) also recommended the practice of repeating mechanical pollination for increased total yield of date, based on the results of cultivar Zahidi. In the comparison work, made during the year 2003-2004, revealed that generally the fruit set was 48-58% more in case of mechanical pollination than the method of keeping strands in the female spathes. The response varied from variety to variety i.e., Hillawii (27.47%), Dhaki (190.35%), Shamran (173.67%) and Khadrawi (285.04%). The developed date Pollinator can effectively pollinate trees up to a height of 30-35 feet. It is further needed to improve this device which can pollinate higher date palms too and there is also room for its development into power operation in this regard, in future.

The results given in table 2 indicate that highest number of fruit set/spathe have been recorded in all the varieties where Pollinator was used for pollination, followed by the method of

manual pollination. Whereas, the pollination under natural conditions failed to exert any influence in this regard, except the variety Hillawii where 265 fruit set were observed against Pollinator method (820 fruit set) and Manual method (643 fruit set). The fruit set under natural conditions, in other cultivars, like, Dhaki, Shamran and Khadrawi remained at the almost negligible level, i.e., 3 to 34.6 fruit set per spathe. The maximum response of cv. Hillawii to the pollen as compared to the other varieties might be due to its high stigma receptivity. Anyhow, the efficiency of the pollination by Pollinator is un-comparable with other techniques and under field conditions the success is as high as 95 to 98 %.

Conclusively, the pollination by modified Pollinator is so far the only best method to achieve the targets of high production in dates with the limitation of its use for the trees, having height above 32 feet. Such trees could be pollinated by using a small rod pollinator (6 feet) by a skilled person after climbing up the tree. The use of all other techniques are not recommended now.

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TABLES

Table 1: Specification of the in use, developed Pollinator

S. No.	Details	Specification
1.	Total length of the pollinator	26 feet
2.	Length of the base pipe	10 feet
3.	Weight of base pipe	3.5 kg
4.	Length of upper pipe	10 feet
5.	Length of middle pipe	10 feet
6.	Weight of upper pipe	1.5 kg
7.	Length of iron rod and hook	9.0 inch
8.	Hook area	3.0 x 2.5 inch
9.	Diameter of base pipe	1.0 inch
10.	Diameter of middle pipe	0.75 inch
11.	Diameter of upper pipe	0.50 inch
12.	Plastic pipe diameter	0.375 inch
13.	Plastic pipe length	30 feet
14.	Puffer size	4.0 x 2.0 inch
15.	Pollen container size (Plastic)	400 ml (5.25x2.75 inch)
16.	Puffer tube size	0.375 x 13.0 inch (Both sides)
17.	Dusting capacity	35.0 mg/puff
18.	Size of valves	1.0 x 0.375 inch 3.0 x 0.375 inch

Table 2: Comparison of different methods of pollination on fruit-setting/retention during the years, 2003-04

Methods of Pollination	Name of month	cv. Hillawii	cv. Dhaki	cv. Shamran	cv. Khadrawi
Pollination with Pollinator	May	820.0	653.3	477.0	489.0
	June	816.0	502.0	475.0	488.0
	July	798.0	414.0	427.0	472.0
Pollination by Insertion of invested male spikelets (8-10)	May	643.3	225.0	174.3	127.0
	June	619.0	201.0	169.0	125.0
	July	607.0	157.0	147.0	113.0
Under Natural Conditions (No Manual Pollination)	May	265.0	3.0	23.3	34.6
	June	251.0	2.0	20.0	31.0
	July	223.0	2.0	13.0	19.0

FIGURES

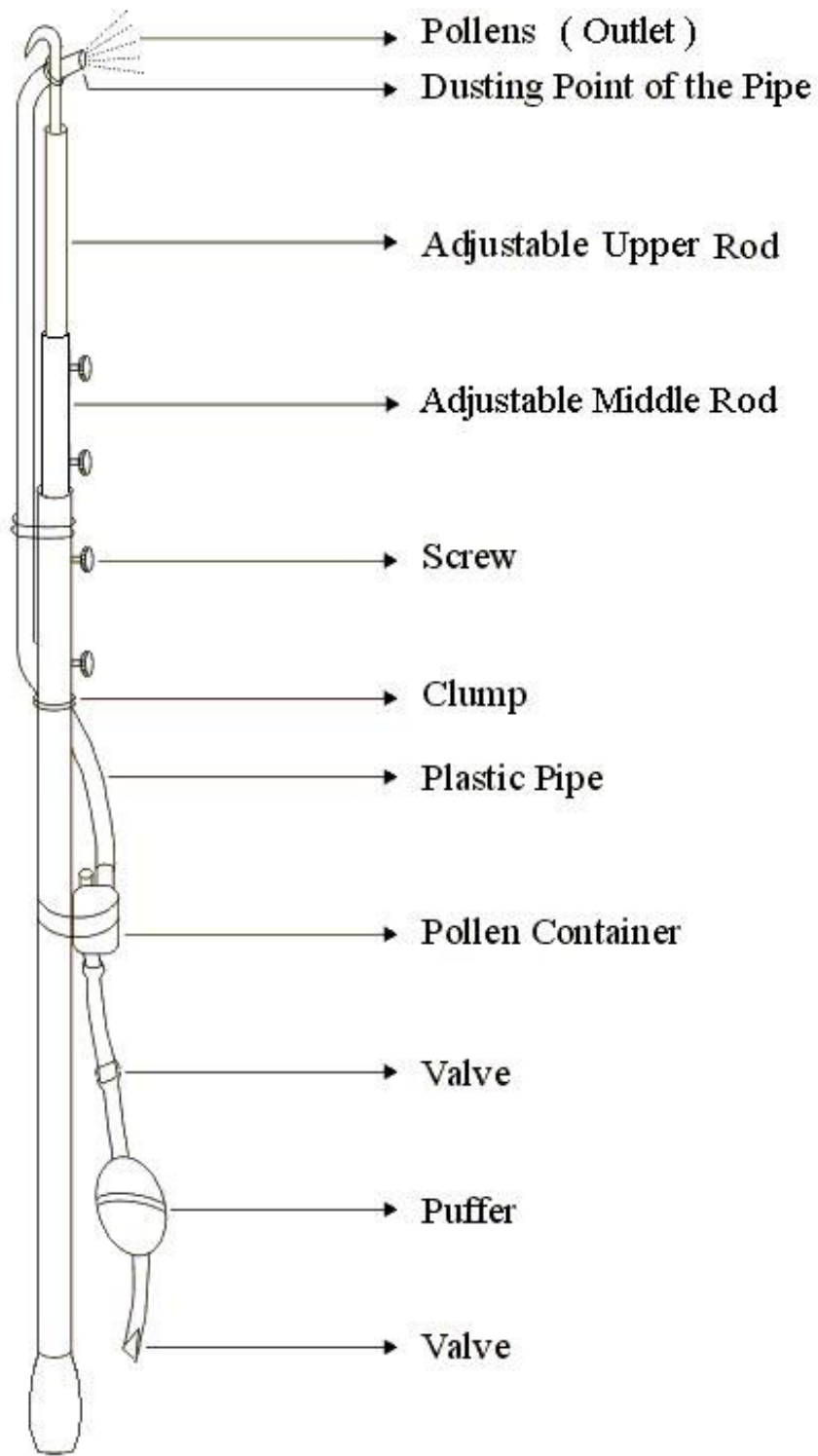


Figure: Hand date palm pollinator