INDIAN JOURNAL OF ARID HORTICULTURE
Vol.9 (1-2): 47-51

Screening of date palm varieties for resistance against post harvest fruit rot

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(Received: 19.12.2014; Accepted: 18.02.2015

Abstract

The experiments were conducted at Date palm farm, Agricultural Research Station SKRAU, Bikaner during Kharif 2013 and *Kharif* 2014 to record the incidence percentage of different post harvest diseases on date palm fruits for screening of date palm varieties for resistance. Eight varieties *viz.*, Zahidi, Sayar, Khalash, Nagal Hilali, Ruziz, Khasab, Halawy and Barhee were selected Seven fungal rot pathogens were isolated from infected date plam fruits *viz.*, *Botryodiplodia, A. niger, A. flavus, Rhizopus sp., Fusarium sp. and Penicillium sp.* In first year of the experiment, none of the varieties were found resistant where as six varieties *viz.*, Zahidi, Sayar, Khalash, Nagal Hilali, Ruziz, and Khasab were found moderately susceptible and two (Halawy and Barhee) were found Susceptible. In second year two varieties *viz.*, Khasab, Khalash were found Resistant, where as six varieties *viz.*, Zahidi, Sayar, Ruziz, Zijaj, Nagal Hilali and Halawy were found moderately susceptible and none of the varieties were found susceptible.

Key words: *Date palm, post harvest diseases, resistance, screening.*

Introduction

Date palm (*Phoenix dactylifera* L.) is an important fruit crop. It belongs to the genus *Phoenix* which is characterized by pinnate leaf palm by the upward and lengthwise folding of the pinnate and furrowed seeds. It is oldest cultivated fruit trees belonging to the family *Palmaceae* in which only 130 palm species grow naturally beyond the tropics, mostly in the subtropics.

The date palm is distributed in Iraq, Saudi Arabia, Iran, United Arab Emirates, Oman, Egypt and Algeria, which are the main date palm producing countries in the world (Chandra *et al*., 1990). The evidence for cultivation of date palm in India has been obtained from excavation of *Mohanjodaro* (Haider *et al*., 2012). The major date palm growing states in india are Rajasthan and Punjab. It is cultivated in hyper partially irrigated western plains of Rajasthan, i.e. Bikaner, Jaisalmer, Jodhpur, some part of Sri Ganganagar and Churu which have hot arid climates and in some parts of Punjab. Being tolerant to drought and salinity, it is a potential fruit palm of dry and arid parts of the country (Trifi *et al*., 2000). Therefore, Rajasthan qualifies to be an ideal home for commercial cultivation of date palm,since majority of agro climatic conditions, such as 25-40°C temperature for flowering and rain free condition for fruit ripening required for cultivation of this crop are partly or fully fulfilled in Rajasthan. The varieties like Halawy, Zahidi, Khalas, Barhee and Khadrawy have been found suitable for production of higher yield in western Rajasthan (Singh e*t al.,* 2003). Post harvest diseases causes huge losses to the date industries in both quality and quantity of production. The date palm is severely affected by various diseases caused by fungus, bacteria, nematodes and phytoplasma. Among the diseases, date palm is severly affected by several diseases like **f**ruit rots caused by *Aspergillus niger*, *Aspergillus phoenicum, Alternaria alternata, Phomopsis, Penicillium roseum, Penicillium corylophilum, Botryodiplodia* and *Rhizopus stolonifer.*

Post harvest fruit rots cause considerable loss when humid and rainy weather occur during the ripening season. Fruit rots are a major constraint and occur whenever dates are grown. The economic importance of fruit rots vary greatly from year to year since its incidence is governed by climatic conditions particularly, high humidity and rain. (Calcat, 1959)

During last several years, the incidence as well as intensity of fungal fruit rots of date palm increased considerably. Keeping in view of the seriousness of the disease and economical importance of this fruit plant, the present investigation was done.

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Material and Methods

Samples; All samples were collected from date palm farm, Agricultural Research Station, SKRAU, Bikaner.

Identification of different microorganisms causing post harvest fruit rots in date palm

The harvest fruit (rotted *doka* stage) & eight varieties of date palm were placed in sterilized petri dishes having blotter paper (Whatman No.42) at temperature range of 26-30 °C in controlled conditions. The supplement supply of sterilized distilled water was given when requires. After 15 days colonies developed in fruit of different varieties were viewed under microscope for its identification. Isolates were maintained in PDA slants for further studies. Each treatment was replicated four times. The frequency in percent was also calculated.

Varietal screening against fruit rots.

Eight varieties of date palm *viz.*, Zahidi, Sayar, Khalash, Nagal Hilali, Ruziz, Khasab, Halawy and Barhee were examined naturally to record the incidence percentage of different diseases on fruits and varieties screened against fruit rots at *doka* stage for two successive *kharif* seasons 2013 and 2014. Severity was calculated on the basis fruits of area damaged with 0-5 scales as given below:

0 - No infection
1 - 0-10% fruit damaged
2 - 11-25% fruit damaged
3 - 26-50 % fruit damaged
4 - 51-75% fruit damaged
5 - 76-100% fruit damaged

The severity and PDI were calculated using following formula

$$PDI = \frac{\text{Sum of all numerical rating}}{\text{Total No. of fruit examined x Maximum ratting}} \times 100$$

Post harvest fruit rots studies were done through Blotter Paper Technique, three fruits were kept in each petri-dish with three replication of each cultivar. The varieties were categorized in the following categories:

Category	% Severity
Resistant (R)	: 0-5% disease severity
Moderately resistant (MR)	: 5.1-20 % disease severity
Susceptible (S)	: 20.1-50% disease severity
Highly susceptible (HS)	: 0.1- above % disease severity

Results and Discussion

The harvested fruits (rotted *doka* stage) of 8 varieties of date palm were taken for the identification/presence of micro-organism under laboratory controlled condition. The cultivars of date fruits were observed to infected by seven fungi. It was notices that the fungal *Aspergillus niger, Aspergillus flavus, Rhizopus sp, Botryodiplodia*, *Mucor* sp. *Fusarium* sp. and *Penicillium sp.* appeared on tested varieties of date palm with varying frequency during both kharif season, of 2013 and 2014.The data presented in Table-1 revealed that eight screened varieties were infected by fruit rots caused by *Botryodiplodia, A. niger, A. flavus, Rhizopus* sp., *Fusarium* sp., *Mucor* sp. and *Penicillium* sp. Fruit rot percentage were ranging between 8.35 to 21.15 per cent and 6.67 to14.67 per cent during *kharif* 2013 and *kharif* 2014 respectively. Post harvest fruit rots in percentage were ranging from16.31 to33.33 per cent and 4.00 to 33.33 per cent during *Kharif,* 2013 and *Kharif,* 2014, respectively (Table-2). Among them, none was found resistant during kharif 2013 but two varieties namely Khasab and Khalash were found resistant during *kharif* 2014. Six varieties *viz.*, Zahidi, Sayar, Khalash, Nagal Hilali, Khasab and Ruziz were recorded moderately susceptible to the disease having 5.1-20 per cent infection during *kharif* 2013 and six varieties *viz.*, Zahidi, Sayar, Nagal Hilali, Barhee, Ruziz and Halawy were found moderately susceptible during *kharif* 2014. Highest fruit rot infection was recorded in variety Barhee (21.15%), followed by Halawy (20.21%). None of the tested varieties were found highly susceptible during both the season. Similar results were obtained by Bokhary (2010) where six different varieties of date-palm *viz.* Sukhari, Saggae, Rotana, Kholasi, Rashoodia and Nabtat Ali were screened for seed borne fungi. Eleven species *Alternaria*, *Eurotium*, and *Fusarium* (two species), *Aspergillus*, *Drechslera*, *Penicillium*, *Rhizopus*, and *Curvularia* (one species each) belonging to nine different genera of fungi were isolated. Karampour and Pejman(2007) isolated many fungal species from affected date palm trees showing Date Bunch Fading (DBF) disorder. These include *Alternaria sp*., *Aspergillus flavus*, *A. niger*, *Penicillium sp*., *Fusarium sp*., *Trichoderma sp*., and *Thielaviopsis paradoxa*.

Table 1. Presence of M.O. causing post harvest fruit rots in different variety of date palm (A=*Kharif* 2013, B=*Kharif* 2014)

S.No.	Varieties	*Botryodiplodia*		*Aspergillus niger*		*Aspergillius flavus*		*Rhizopus sp*		*Fusarium sp.*		*Mucor sp.*		*Penicillium sp.*	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Zahidi	+50	+50	+50	+75	+50	+50	+25	+50	-	+15	-	-	+25	+20
	Sayar	+25	+25	+50	+25	+25	+25	+25	+50	-	+50	-	-	+25	-
	Barhee	+50	+50	+75	+25	+75	+25	+50	-	-	-	-	-	+25	-
	Nagal Hilali	+25	+25	+50	+25	+50	+25	-	-	-	-	-	-	-	-
	Ruziz	-	-	-	+25	-	+25	-	+25	-	+25	-	+25	-	-
	Khasab	+50	+50	+50	+25	+75	+50	+75	-	-	+25	-	-	+25	+50
	Khalash	+50	+50	+50	+75	+50	+75	+75	-	-	+25	-	-	+25	+50
	Halawy	+50	+50	+50	+75	+50	+75	+25	-	-	-	-	-	+25	-

Table 2. Varietal screening against fruit rots (*Kharif* 2013 and *Kharif* 2014)

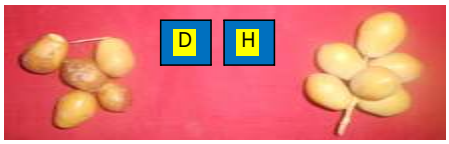
S.No.	Varieties	*Fruit rots in percentage		*Post harvest fruit rots in percentage	
		Kharif 2013	Kharif 2014	Kharif 2013	Kharif 2014
	Zahidi	8.33(16.77)	6.67 (14.97)	30.36(33.38)	16.67 (24.09)
	Sayar	11.66(19.95)	10.67(19.05)	30.66(33.62)	31.33(34.03)
	Barhee	21.15(27.37)	11.33(19.66)	33.33(35.26)	33.33(35.26)
	Nagal Hilali	18.13(25.18)	13.33(21.41)	20.33(26.78)	24.67(29.78)
	Ruziz	17.66(24.80)	10.00(18.43)	21.66(27.72)	25.33(30.21)
	Khasab	10.33(18.72)	2.67(9.40)	16.31(23.81)	4.00(11.53)
	Khalash	12.21(20.44)	4.67(12.48)	31.66(35.25)	24.67(29.78)
	Halawy	20.21(26.64)	14.67(22.52)	27.66(31.72)	33.33(35.26)
	SEm	3.07	2.90	5.99	6.21
	CD at 5%	9.20	8.69	8.46	8.78

*** Average of 3 replicati ons. Figures in parenthesis are angular transformed values .**

Table 3. Classification of date palm cultivars on the basis of their reaction

S.No.	Categories	Disease Severity (%)	Varieties	
			Kharif 2013	*Kharif* 2014
1	Resistant (R)	0-5%	Nil	Khasab, Khalash
2	Moderately resistant (MR)	5.1-20 %	Zahidi, Sayar, Khalash, Nagal Hilali, Ruziz, and Khasab	Zahidi, Sayar, Ruziz, Barhee, Nagal Hilali and Halawy,
3	Susceptible (S)	21.1-50%	Halawy and Barhee	Nil
4	Highly Susceptible (HS)	Above 51.1%	Nil	Nil

Plate 1. Varietal screening and post harvest fruit rots of date palm.

S. No.	Variety	Fruit rot	Post harvest fruit rot
	Zahidi		
	Sayar		
	Barhee		
	Nagal Hilali		
	Ruziz		
	Khasab		
	Khalash		
	Halawy		

Note; (D=Diseased H= Healthy)

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