Proceedings:
International Conference on
Mango and Date Palm: Culture and Export.
20th to 23rd June, 2005.
Malik *et al.* (Eds), University of Agriculture, Faisalabad.

EVALUATION OF DATEPALM VARIETIES AGAINST *Graphiola* LEAF SPOT DISEASE

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ABSTRACT

Graphiola leaf spot, caused by the fungus *Graphiola phoenix* (Moug.) Poit, is one of the serious diseases of date palm (*Phoenix dactylifera* L.). The fungus develops sub-epidermally as small spots (sori) on pinnae and rachis and interferes considerably with the photosynthetic activity of the plants. Severe infection causes pre-mature death of leaves resulting in yield reduction and impairement of fruit quality. An attempt has been therefore, made to screen the date palm varieties by using sori number as indices and also establish their correlation with the disease severity for devising an effective spray schedule. Ten different varieties viz., Zahidi, Hillawi, Thoory, Barhee, Degletnoor, Khalasa, Shamran, Hayani, Khadrawi and Medjool were evaluated against this disease at PAU, Regional Fruit Research Station, Abohar, India. The sori number and disease severity were exploited to ascertain the resistance/susceptibility of the varieties. The varietie(s) having sori number less than 4 per sq.cm were categorized as resistant (Zahidi), 4-8 moderately susceptible (Thoory, Hillawi, Barhee, Degletnoor, Khalasa, Shamran), 8-12 were susceptible (Hayani and Khadrawi) and more than 12 were highly susceptible (Medjool) to the disease. A significant positive correlation between number of sori and disease severity was established. The Prediction Model for forecasting the disease severity by using the number of sori was computed as, Y = 12.06 + 4.78 (Sori No). The validity of the model was tested and predicted disease severity was significantly positively correlated with the observed disease severity. This model may prove valuable for screening of the date germplasm against *Graphiola* disease and devising a judicious spray schedule.

INTRODUCTION

Graphiola leaf spot [*Graphiola phoenix* (Moug) Poit] is one of the most serious diseases of date palm. The fungus develops subepidermally as small spots (sori) on both sides of the pinnae and rachis and considerably interferes with the normal photosynthetic activity of the palm (Sinha et al., 1970; Chander, 1996; Rathore and Khatri, 2003). Severe infection can cause premature death of the leaves resulting in reduction of yield and impairment of fruit quality. Keeping in view the problem, an attempt has been made to screen the date palm germplasm against *Graphiola* leaf spot by exploiting the sori number as tool and establish their relationship with disease severity. A Linear Regression Equation fitted with number of sori for the prediction of the disease severity was also computed for devising a timely spray schedule.

MATERIALS AND METHODS

Ten varieties of date palm viz., Zahidi, Hillawi, Thoory, Barhee, Degletnoor, Khalasa, Shamran, Hayani, Khadrawi and Medjool, growing in the orchard of PAU, Regional Fruit Research Station, Abohar, located in the arid-irrigated region of Punjab between 44.12 ^{o}E and 30.08 ^{o}N, with an altitude of 185.8 m, were screened against *Graphiola* leaf spot during the years 2001-02 and 2002-03. Observations were recorded by taking two leaves of each variety. The number of sori in one square cm area (1x1 cm) was counted from ten randomly selected pinnae per leaf and the mean number of sori was calculated. Disease severity was recorded by observing ten pinnae per leaf using 0-5 grade (0 = no disease; 1 = 1-20 %; 2 = 21-40 %; 3 = 41-60 %; 4 = 61-80 %; 5 = 80-100 % pinnae area covered with *Graphiola* sori and the Per cent Disease Index (PDI) was calculated as;

$$PDI = \frac{\text{Sum of all ratings}}{\text{No. of observations}} \times \frac{100}{\text{Maximum grade No.}}$$

The varieties exhibiting number of sori less than 4 per square cm were rated as resistant, 4-8 as moderately susceptible, 8-12 as susceptible and more than 12 were highly susceptible to the disease. A correlation matrix between number of sori and disease severity was also established for evaluating the data palm varieties against this menace.

RESULTS AND DISCUSSION

Sori Number and Disease Severity

The results presented in Table 1 indicate the susceptibility level of different date palm cultivars to *Graphiola* leaf spot. The number of sori ranged from 3.65 to 14.13 per sq. cm. Of the screened varieties, Zahidi exhibited significantly less number of sori (3.65/sq. cm) and disease index (17.61 %) showing resistance to the disease. Significantly maximum number of sori (14.13/ sq. cm with 70.40% disease index) was recorded in Medjool and was rated as highly susceptible to the disease. Thoory, Hillawi, Barhee, Degletnoor, Khalasa and Shamran showed 6.18 to 7.50 sori per square cm with 36.75 to 58.37 % disease severity and were moderately susceptible to the disease.

The present findings corroborate with those of Carpent and Ream (1976), Sinha et al. (1970) and Nixon (1957) who used sori as standard for evaluating the different date palm varieties against *Graphiola* leaf spot.

Correlation Matrix of Sori with Disease Severity

A coefficient correlation between number of sori and disease severity was established. A significant positive correlation (+ 0.887) between number of sori and disease index was established. In general, the varieties exhibiting more number of sori per square cm. have also shown more disease severity and vice-versa. Sinha et al. (1970) recorded similar observations while evaluating the susceptibility of date palm varieties to *Graphiola* leaf spot and listed Barhee, Abdul Rehman, Gizaz, Iteema and three Egyptian selections as resistant to the disease.

Prediction Model

A Linear Regression Equation fitted with number of sori for predicting the disease severity was also computed as,

$Y = 12.06 + 4.78$ (Sori No.)

$R^2 = 0.7864$

The R^2 value (coefficient of determination) has indicated that 78.64 % variation in date palm *Graphiola* leaf spot could be monitored by the presence of number of sori. The validity of the model was tested by feeding the observations of number of sori and the predicted disease severity was found to be positively (+0.936) associated with the observed disease severity and

was significant, r = 0.632. This model can be exploited for evaluating the date palm germplasm against *Graphiola* leaf spot disease by feeding the presence of number of sori in a particular variety.

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TABLES

Table 1: Reaction of date palm cultivars to *Graphiola* leaf spot

Severity Rating (Sori No.)	**Date palm cultivar**	**Sori/sq.cm (No.)**	**Disease Index (%) (Observed)**	**Disease Index (%) (Expected)**
Resistant (< 4)	Zahidi	3.65	17.61	29.51
Moderately Susceptible (4-8)	Thoory	6.18	36.75	41.60
	Hillawi	6.50	43.46	43.13
	Barhee	6.94	44.00	45.23
	Deglet Noor	7.00	49.16	45.52
	Khalasa	7.44	56.36	47.62
	Shamran	7.50	58.37	47.91
Susceptible (8-12)	Hayani	10.00	61.07	59.86
	Khadrawi	10.30	64.00	61.29
Highly Susceptible (> 12)	Medjool	14.13	7040	67.54
CD(p=0.05)		1.58	2.13	---
Correlation matrix (Critical value of r=0.632)		---	+0.887	+0.974