

Status of pomegranate fruit diseases in Kutch district

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ABSTRACT

Survey was conducted in the eight locations of Bhachau taluka and six locations of Anjar taluka during 2017-18, observed the Alternaria leaf / fruit spot and anthracnose fruit diseases of pomegranate. Maximum disease severity (36.5%) of alternaria fruit spot was observed in the Chobari village of Bhachau taluka. Infection of anthracnose was found maximum (35.20%) at Bhachau. Diseased samples were collected during the survey and pathogens were isolated. Based on the morphological characters pathogens were identified and pathogenicity was proved.

Key words: Survey, Pomegranate, Alternaria leaf spot, Anthracnose

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Pomegranate (*Punica granatum* L.) is an ancient and commercially important fruit belongs to the family puniceae. Pomegranate is a native of Iran. India contributes around 50 per cent to the total global pomegranate production. Maharashtra, Karnataka and Gujarat are the leading states, cultivating pomegranate on large scale. In Gujarat Kutch district is the second largest producer of the pomegranate after the Banaskantha (Anon., 2017). Successful cultivation of pomegranate in recent years suffers from various diseases such as, fruit rot, bacterial spot/canker and anthracnose etc. causing significant loss in the recent years (Anon., 2013). Among these fruit spots caused by *Colletotrichum gloeosporioides* and *Alternaria alternata*, take a heavy toll on the crop. This results in drastic reduction in the yield

as well as marketability. *Alternaria alternata* causes both fruit spot/rot and leaf spot on pomegranate.

Madhukar and Reddy (1976) in India reported for the first time a leaf spot due to *A. alternata* on pomegranate, Farr et al. (2007) reported the fruit rot caused by *Alternaria* sp. in USA, Mexico. In India, anthracnose disease was first reported by McRae (1924). Leaf spot and fruit rot (*A. alternata*) has been noticed in northern Karnataka including Bijapur, Bagalkot and Koppal districts with disease severity ranging from 15-80 per cent in almost all the pomegranate growing areas (Archana, 2012). Anthracnose was recorded the severity from 19.99 to 28.76 per cent in major pomegranate growing areas of Karnataka (Nargund et al., 2012). In Gujarat Kutch district is the second largest producer of the pomegranate after the Banaskantha (Anon., 2017). Successful cultivation of pomegranate suffers from many diseases, it is ultimately reduces the market value. In order to know the severity of the different fruit spot of the pomegranate the present study was undertaken.

MATERIALS AND METHODS

Survey

Roving survey was conducted during 2017-18 in Kutch district. In Kutch district, major pomegranate growing Bhachau and Anjar talukas were selected and in each taluka six to seven villages were selected, five orchards were randomly selected in each village for survey study. Observations on disease severity,

stage of the crop, cultivar and Bahar details were recorded. Severity was recorded by following 0 to 5 scale during fruit development stage to maturity stage. Leaf infection was also recorded by following 0 to 5 scale (Nargund et al., 2012)

STATUS OF POMEGRANATE FRUIT DISEASES

Grade	Per cent area of infection on fruit		Reaction
	On fruit	On leaf	
0	No infection	No infection	Immune
1	1-10	Upto 5	Resistant
2	11-25	6-10	Moderately resistant
3	26-50	11-20	Moderately susceptible
4	51-75	21-50	Susceptible
5	>75	50	Highly susceptible

Per cent disease index (PDI) was calculated by using following formula proposed by Wheeler (1969).

$$\text{PDI} = \frac{\text{Sum of the individual disease ratings}}{\text{Number of fruits observed} \times \text{Maximum disease grade}} \times 100$$

Isolation, identification, proving pathogenicity and studies on symptoms: The isolation of the fungus was made by standard tissue isolation technique. Pathogens were identified with microscopic observation by taking mycelial and spore characters. Pathogenicity of the isolated fungus was tested by following Koch's postulates on

cultivar Bhagwa Sinduri raised in pots. Plants were inoculated with the pure culture and incubated for symptom expression. Symptoms appeared within ten days after inoculation of the plants. Symptoms were compared with the original symptoms of the disease. The fungus was reisolated and observed for the morphological characters.

RESULTS AND DISCUSSION

Alternaria leaf/ fruit spot

Survey: Roving survey was carried out in the Bhachau and Anjar taluka of Kutch district during 2017-18, the diseases observed and their severity was recorded both on the leaf and fruit, the results obtained were presented in the Table 1.

Alternaria leaf spot was observed in all the locations surveyed with severity ranged from 4.5 to 16.6 per cent with mean severity of 8.71 per cent. Maximum PDI (16.6%) was observed in the Chobari village of Bhachau taluka, followed by Navagam (PDI 11.7%) and least was observed in May village and Regional Research Station, Bhachau that is 4.5 per cent. Alternaria fruit spot was severity was ranged from 5.8 to 36.5 per cent with mean severity of 17.08 per cent. Maximum disease severity of 36.5 per cent was observed in Chobari village of Bhachau taluka, followed by Sangamner (24.5 %) village of Bhachau taluka and least PDI (5.8 %) was observed in the Regional Research Station, Bhachau. In all the surveyed locations, Bhagwa Sindhuri was major cultivar of pomegranate and most of the farmers followed either Mrig Bahar or Hasta Bahar treatment, it indicated that the cultivar Bhagwa Sindhuri was

found moderately resistant (MR) to moderately susceptible (MS) category as per the disease rating scale. Presence of favorable environmental conditions, growing susceptible cultivars, build up of inoculum level year after year due to improper pruning practices are the main reasons for maximum disease severity. Same observations have been recorded by Archana (2012), who conducted the survey in northern Karnataka and reported 15-80 per cent severity of Alternaria fruit spot/rot. Adesh et al., (2017), conducted the farm survey at Punjab Agricultural University, Punjab and reported that among five cultivars Bhagwa cultivar recorded the maximum disease severity.

Isolation, identification, proving pathogenicity and studies on symptoms: Spots are small dark brown in color and round or irregular concentric rings were observed in the centre. Later these spots increased in the size, coalesced and affected leaves become yellow and dropped down. On the fruits they may cover larger fruit area. Symptoms observed during the survey have been presented in the photographs (Fig. 1). Diseased leaf samples

were collected from the pomegranate fields during the survey. Pure culture was established by single spore isolation method. The fungus was identified as *Alternaria alternata* (Fr.) Keissler by comparing its morphological characters with the published reports (Ellis, 1971) and proved the pathogenicity by following Koch's postulates.

Anthracnose

The disease severity of anthracnose on leaf was varied from 0 to 12.8 per cent. Maximum disease severity of 12.8 per cent was observed at Bhachau local area, followed by Satapar village of Anjar taluka with 11.8 per cent severity. Orchards were found disease free in Ambapar and Nagalpar villages of Anjar taluka. On the fruit the disease severity was ranged from 0 to 35.2 per cent. The maximum PDI (35.2 %) was recorded in Bhachau local area. Fruit infection of anthracnose was absent in the Ambapar and Nagalpar villages of Anjar taluka. Bhagwa Sindhuri cultivar was showed the resistant (R) to moderately susceptible (MR) reactions in all the surveyed locations. Higher temperature during the Mrig Bahar with intermittent rainfall have contributed for maximum disease severity. Same observations were recorded by the Chavan and Dhutraj (2017),

who conducted the survey Parbhaani district of Marathwada region of Maharashtra state. Cultivation of the same cultivar in the large area results in buildup of the inoculum.

Isolation, identification, proving pathogenicity and studies on symptoms: Pinhead size of black to brown water soaked spots appeared on the leaves with circular margin. In advanced stage, these spots enlarged, coalesced and resulted in bigger patches. In severe case leaves dried up. On fruits, brown spherical depressed spots occurred in scattered form on the pericarp. In advanced stage, these spots coalesced to form necrotic patches over the surface of the fruit (Fig. 2). Diseased leaf samples were collected from the pomegranate fields during the survey. Pure culture was established by single spore isolation method. The fungus was identified as *Colletotrichum gloeosporioides* (Penz.)Penz. & Sacc. by comparing its morphological characters with the published reports (Ellis, 1971). Healthy seedlings developed from the air layers of 4-5 years old pomegranate cv. Bhagwa Sindhuri were raised in earthen pots, size 6"×5" filled with sterilized soil. Pathogenicity of the isolated fungus was tested following Koch's postulates.

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Table 1 Status of pomegranate fruit diseases in Kutch district

District	Taluka	Village	Genotype	Bahar	Stage of the crop	Per cent Disease Index/Severity			
						On Leaf		On Fruit	
						Alternaria Leaf Spot	Anthra cnose	Alternaria Fruit Spot	Anthra cnose
Kutch	Bhachau	Bhachau local	Bhagwa sinduri	Mrig	Flowering & Fruiting	10.6	12.8	18.6	35.2
		Chobari	Bhagwa sinduri	Mrig	Flowering & Fruiting	16.6	8.6	36.5	12.1
		Gunatitpura	Bhagwa sinduri	Hasta	Flowering & Fruiting	6.5	8.0	11.8	9.2
		Kharoi	Bhagwa sinduri	Mrig	Flowering & Fruiting	9.8	5.8	21.5	10.6
		Manfara	Bhagwa sinduri	Mrig	Flowering & Fruiting	5.8	4.6	10.6	11.6
		May	Bhagwa sinduri	Mrig	Flowering & Fruiting	4.5	5.7	11.5	9.6
		RRS, Bhachau	Bhagwa sinduri	Hasta	Flowering & Fruiting	4.5	4.0	5.8	6.6
		Sangamner	Bhagwa sinduri	Mrig	Flowering & Fruiting	11.5	11.6	24.5	28.8
	Taluka Mean					8.72	7.63	17.60	15.46
	Anjar	Ambapar	Bhagwa sinduri	Mrig	Flowering & Fruiting	9.6	-	13.9	-
		Nagalpar	Bhagwa sinduri	Mrig	Flowering & Fruiting	8.9	-	14.5	-
		Navagam	Bhagwa sinduri	Mrig	Flowering & Fruiting	11.7	10.8	21.8	20.8
		Pashwadi	Bhagwa sinduri	Mrig	Flowering & Fruiting	5.6	6.8	12.9	19.9
		Satapar	Bhagwa sinduri	Mrig	Flowering & Fruiting	10.5	11.8	22.9	33.5
		Rampar	Bhagwa sinduri	Mrig	Flowering & Fruiting	5.9	10.8	13.4	16.6
	Taluka Mean					8.70	6.70	16.56	15.13
District Mean					8.71	7.16	17.08	15.29	



Appearance of small concentric ring spots on the leaves and flower



Figure 1 Symptoms of Alternaria leaf/ fruit spot



Pin head sized spots on leaves



Small depressed spots on the fruit



Severely infected fruits showing necrotic patches
Figure 2 Symptoms of anthracnose of pomegranate