Incidence of Fungal Aerospora over Grape And Pomegranate Fields

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Abstract- *Incidence of air fungi over grape and pomegranate fields were studied using continuous volumetric Tilak air sampler at Baramati area (Dist. Pune, Maharashtra). While study 20 fungal genera from grape fields and 23 fungi from pomegranate fields were noticed. The occurrence of Deuteromycotina spores were highest followed by Ascomycotina in both fruit crops. Percentage contribution of Myxomycotina and Mastigomycotina was comparatively minor. Most frequent Deuteromycotina spores were Alternaria, Aspergillus, Cercospora, Colletotrichum, Fusarium and Helminthosporium.*

Keywords- Aeromycoflora, grapevines and pomegranate

I. INTRODUCTION

Grape (Vitis vinifera L.) and pomegranate (Punica granatum L.) are widely grown economically important horticultural plants. These plants are suffer from variety of fungal, bacterial and viral diseases, among these fungal diseases are most destructive ones (Antonia and Lubomira, 2007 and Aher et al., 2015). Grapevines are affected by many fungal pathogens viz. Plasmopara viticola causes downy mildew, Uncinula necator causes powdery mildew and Alternaria alternata causes leaf blight disease (Kanade et al., 2018, 2018a). Pomegranates are subjected to various air borne fungal diseases like leaf spot caused by Cercospora, burning of fruits and leaves caused by Alternaria alternata (Aher et al., 2015).

Aeromycology is branch of aerobiology that deals with dispersion of spores and other fungal elements in indoor and outdoor air (Kasprzyk, 2008). The study of fungal aerospora is important to understand the dissemination of pathogenic spores in the atmosphere and successful disease management. According to Maria et al. (2009) knowledge about the fungal spores most abundant in the atmosphere of a vineyard is of great use since it allows development of prediction models of the spore concentration and therefore application of phytosanitary treatments only when high levels of fungal propaguls are detected.

Grape and pomegranates are major fruit crops of study area (Baramati, Dist. Pune, MS). However, they are affected by various fungal diseases. In this connection, present attempt has made to study the fungal spore incidence over the grape and pomegranate fields at Baramati area.

II. MATERIALS AND METHODS

Air sampling was carried out over grape fields during 9 to 16 July, 2017 and 5 to 12 November, 2017 and over pomegranate fields during 21 to 28 July, 2017 and 12 to 19 December, 2017 using continuous volumetric Tilak air sampler which was placed at the centre of the fruit crops at the height of 4 feet (Tilak and Kulkarni, 1970). This instrument runs on electric power supply and provides a continuous sampling of air for 8 days. The electric clock fitted in the instrument and synchronized with the drum. Air sucked through the orifice of the projecting tube at the rate of 5 litres per minute and it impinges on the transparent cello tape which is 1.5 cm in breadth and fixed on slowly rotating drum. The drum completes one circle in 8 days, this gives the trace of catches for 8 days. After weekly sampling the rotary drum was taken out and cello tape was divided in to 16 divisions where each piece of cello tape represent the air sampling of 12 hours. The cello tapes were mounted in glycerine on glass slides and trapped spores were identified based on morphological characters and using standard literature up to generic level only (Ainsworth et al., 1973).

III. RESULTS AND DISCUSSION

During the investigation 20 fungal genera were reported over the grape fields from Baramati area of Pune district. Major contribution of fungal genera were reported from Deuteromycotina (45%) followed by Ascomycotina (35%), Zygomycotina (10%) and Mastigomycotina as well as Basidiomycotina (5%) (Table-1). Most prominent genera were found belongs to Deuteromycotina viz. Alternaria, Cercospora, Colletotrichum, Fusarium and Aspergillus. On the other hand genera belongs to Mastigomycotina and Zygomycotina were petty in occurrence. Most common Basidiomycotina spores like uredospores and smut spores

were also noticed abundantly. According to Antonia and Lubomira (2007) black rot caused by Guignardia bidwellii, white rot by Metasphaeria diplodiella, powdery mildew by Uncinula necator, downy mildew by Plasmopara viticola, grey mould by Botrytis are the most common fungal diseases of grapevines. Highest concentration of pathogenic fungal spores viz. Botrytis (42.4%) followed by Uncinula (26.1%) and Plasmopara (24.7%) were reported from grapeyards by Maria et al. (2009) at Spain.

Over the pomegranate fields total 23 fungal genera were investigated. The percentage contribution of Deuteromycotina is highest (60%) next of Ascomycotina (13.04%), Mastigomycotina as well as Zygomycotina (8.69%) and Myxomycotina and Basidiomycotina (4.34%). Deuteromycotina fungal flora was noticed as dominantly and Alternaria, Aspergillus, Cercospora, Colletotrichum, Fusarium, Gleosporium and Helminthosporium were occurred frequently (Table-1). Similar observations were made by Aher et al. (2015) from pomegranate fields and reported highest contribution of Deuteromycotina spores; furthermore they reported that Alternaria, Cercospora, Helminthosporium, Curvularia, Colletotrichum and Dreschleria were pathogenic to pomegranate crops. Fungal diseases of pomegranates are responsible for rotting of fruits, irregular spots on fruits and leaves, discolouration of fruits and ultimately reduce the market value (Aher et al., 2015).

Many researchers of aerobiology unanimously agreed with the chief contribution of Deuteromycotina spores in the atmosphere of majority all types of agricultural fields. In Marathwada region, Vaidya (1990) and Jadhav (1990) reported Helminthosporium spores contribution (3.07% and 2.23%) to the total aerospora over the different agricultural fields. Aspergillus was the most frequent genus along with Cladosporium, Penicillium and Alternaria spores were also fairly abundant from fruit market environment, Nagpur were examined by Kakde et al. (2001). Frequent occurrence of Alternaria was studied by Vijayalaxmi et al. (2001) over chilly, Kumar and Kolte (2006) over mustard and Saha et al. (2006) over brinjal fields. Singh et al. (2003) investigated Fusarium sp. most frequent at Manipur and by Dahia and Gupta (2003) at Rohtak city. According to Mahajan and Cholake (2007) Curvularia was most frequent species in air. Cladosporium is most correlated with meteorological parameters which influence dispersion of spores easily carried through air (Ianovici, 2008). Drechslera contributed 5.60% in the total aerospora of Raipur (Sharma, 2009). Lohare and Kareppa (2010) noted that Deuteromycetes dominated all other groups and its mean contribution was 71.76% over onion fields at Udgir (Maharashtra). Highest concentration of Deuteromycetes spores (69.98%) to the total aerospora from sugarcane fields of Nashik were reported by Ahire et al. (2010). Bagwan (2010) noticed the dominance of Aspergillus sp. from the vegetable market of Udgir. The most predominant species found in store houses of onion were Aspergillus niger, A. flavus, Botrytis sp., Fusarium oxysporum, Helminthosporium sp., Trichoderma sp., Mucor mucedo etc. and from ginger were A. niger, F. oxysporum, F. solani, F. zingiberi, Lasiodiplodia sp. and Verticillium thebromae reported by Juri Devi et al. (2010). The dominant Aspergillus occurrence was noticed by many workers from different localities of India and abroad (Shukla and Shukla, 2011). In Nashik, Cercospora contributed 5.27% over the groundnut fields were observed by Sonawane (2013). Aspergillus sp. was most frequent and predominant genus as well as Penicillium sp. and Alternaria sp. spores were also abundant, which are well known allergenic and pathogenic were examined by Kumar et al. (2013) from vegetable market environment of Hapur, Uttar Pradesh. Concentration of air borne fungal spores in main fruit and vegetable market of Agra were studied by Garg et al. (2015) and reported Aspergillus flavus was found to be most dominant and frequent mould in the aerospora.

The objectives of present aeromycological studies were to detect and determine the occurrence of fungal spores and disease forecasting over grapevines and pomegranate fields. This practical application may help to disease management, improve the quality and economy of these fruit crops.

Table - 1 : Fungal spores trapped over grape and pomegranate fields

Fungi	Grape fields	Pomegranate fields
Myxomycotina		
1) *Physarum* sp.	-	+
Mastigomycotina		
2) *Plasmopara* sp.	+	+
3) *Phytophthora* sp.	-	+
Zygomycotina		
4) *Mucor* sp.	+	+
5) *Rhizopus* sp.	+	+
Ascomycotina		
6) *Chaetomium* sp.	+	-
7) *Claviceps* sp.	-	+
8) *Leptosphaeria* sp.	+	-
9) *Meliola* sp.	+	-
10) *Oidium* sp.	-	+
11) *Sporidesmium* sp.	+	-
12) *Thielaviopsis* sp.	-	+
13) *Trichoderma* sp.	+	-
14) *Uncinula* sp.	+	-
15) *Xylaria* sp.	+	-
Basidiomycotina		
16) *Ganoderma* sp.	+	-
17) *Cryptococcus* sp.	-	+

Deuteromycotina		
18) *Alternaria* sp.	+	+
19) *Aspergillus* sp.	+	+
20) *Botrytis* sp.	+	+
21) *Cercospora* sp.	+	+
22) *Cladosporium* sp.	+	+
23) *Colletotrichum* sp	+	+
24) *Curvularia* sp.	-	+
25) *Drechslera* sp.	-	+
26) *Fusarium* sp.	+	+
27) *Gleosporium* sp.	-	+
28) *Helminthosporium* sp.	+	+
29) *Heterosporium* sp.	-	+
30) *Nigrospora* sp.	-	+
31) *Penicillium* sp.	+	+
Others		
32) Sporangiospores	-	+
33) Aplanospores	-	+
34) Thallospores	-	+
35) Rust spores	+	+
36) Smut spores	+	+

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REFERENCES

[1] Aher SK, Dhawale VP and Baviskar PS, 2015. Qualitative assessment of airborne deuterospores over pomegranate (Punica granatum L.) field. Int. J. of Life Sciences, Special Issue A3:18-20.

[2] Ahire PP, Kadam VB and Patel SI, 2010. Atmospheric concentration and seasonal variation in the smut spores at Nashik, Maharashtra, India. Plant Archives, 10(2):963-964.

[3] Ahire PP, Kadam VB and Patel SI, 2010a. Aeromycological (Basidiomycetes) studies at Nashik, Maharashtra, India. Plant Archives, 10(2):967-968.

[4] Ainsworth GC, Sparrow FK and Sussaman AS, 1973. The Fungi Vol. III and IV A. Academic Press, New York.

[5] Antonia S and Lubomira K, 2007. Fungal disease of grapevines. The European Journal of Plant Science and Biotechnology, 1(1):84-90.

[6] Bagwan NB, 2010. Seasonal variation in Aeromycoflora of vegetable market at Udgir, Maharashtra, India. J. Mycol. Pl. Pathology, 40(3):360-364.

[7] Dahia P and Gupta R, 2003. Aeromycoflora of Rohtak city. Ind. J. Aero., 16(1&2): 46-50.

[8] Garg A, Singh R and Singh S, 2015. Incidence of toxigenic isolates of Aspergillus flavus in the aerospora of main fruit and vegetable market at Agra. Nature and Environment, 20(1):33-36.

[9] Jadhav DS, 1990. Aerobiology of groundnut at Kallam. Ph.D. Thesis Dr. B. A. Marathwada University, Aurangabad.

[10] Juri Devi, Sadhana M and Sarma TC, 2010. Aeromycological study of store houses of onion and ginger in Guwahati. The Bioscan, 2:547-552.

[11] Ianovici N, 2008. Preliminary survey of airborne fungal spores in urban environment scientific conference durable agriculture in the context on environmental change. Uni. of Afric. Sci. and Veterinary Medicine, Faculty of Agriculture, IASI, 16-18.

[12] Kakde UB, Kakde HU and Saoji AA, 2001. Seasonal variation of fungal propagules in a fruit market environment, Nagpur (India). Aerobiologia, 17:177–182.

[13] Kanade MB, Awatade Atul, Gulave Akshay, Wagh Sujit, Kalkute Akshay, Chandankar Sourabh and Waghmare Anjali, 2018. Aeromycological investigations over wheat, sugarcane and grape fields at Baramati (Pune), Maharashtra, Bioscience Discovery, 9(1):86-89.

[14] Kanade MB, Awatade Atul, Gulave Akshay, Wagh Sujit, Kalkute Akshay, Chandankar Sourabh and Waghmare Anjali, 2018a. Aeromycoflora over jowar and pomegranate fields at Baramati, Dist. Pune (M.S.), Bioscience Discovery, 9(1):93-96.

[15] Kasprzyk I, 2008. Aeromycology--main research fields of interest during the last 25 years. Ann. Agric. Environ. Med., 15(1):1-7.

[16] Kumar B and Kolte SJ, 2006. Development of Alternaria blight in genotypes of Indian mustard (Brassica juncea (L.) Czern and Cross) under field. Indian Phytopathology, 39(3):314-317.

[17] Kumar S, Sharma S, Kumar M, Sharma PK and Sharma N, 2013. Seasonal variation of fungal propagules in vegetable market environment of Hapur Uttar Pradesh India. International Journal of Microbial Resource Technology, 2(1):1-6.

[18] Lohare SD and Kareppa BM, 2010. Air spora over onion field. International Research Journal, I(3&4):116-117.

[19] Mahajan MC and Cholake PB, 2007. Study of Aeromycoflora inside poultry shed. Nat. Conf. of Aero., 14.

[20] Maria FG, Rodríguez-Rajo FJ, Jato V, Aira MJ, 2009. Incidence of fungals in a vineyard of the denomination of origin ribeiro (Ourense – north-western Spain). Ann Agric Environ Med, 16:263–271.

[21] Saha D, Isha M, Barman HK, Dahar GP and Saha A, 2006. Pathogenecity of Colletotrichum gloeosporiodes (Penzig) saccardo causing anthracnose of different brinjal varieties and disease control using botanicals and antagonists. Indian Phytopathology, 59(3):377.

[22] Sharma K, 2009. Aeromycoflora of dwelling house. Lab Land, 1:49-51.

[23] Shukla S and Shukla RV, 2011. Airborne fungi spores in the atmosphere of industrial town, Korba-Chattisgah, India. Microbiology Journal, 1(1):33-39.

[24] Singh SR, Sangbandi-Seram N and Devi NB, 2003. The fungal microbiota in the working environment of rice mill in Manipur with reference to microbial diversity. Indian J. Aero., 16(1&2):31-45.
[25] Sonawane MD, 2013. Aeromycological studies of groundnut field at Nashik, M.S. Int. J. of Pharm. Res. and Bioscience, 2(6):575-583.
[26] Tilak ST and Kulkarni RL, 1970. A new air sampler. Experientia, 26:443.
[27] Vaidya KK, 1990. Studies in airspora at Aurangabad and its relevance with environmental parameters. Ph.D. Thesis Dr. B. A. Marathwada University, Aurangabad.
[28] Vijayalaxmi M, Srivalli T and Lakshmi N, 2001. Seed fungi of chillies and their phytotoxic effects. Recent Advances in Mycology Plant Pathology and Biotechnology, 6:21.