
Fungal diseases on leafy vegetables from Dhule and surrounding markets

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Abstract: -

During fungal pathogen survey of vegetables from year 2015-17, many preharvest and post-harvest pathogens were recorded. Leafy vegetables frequently available in and around Dhule vegetable markets includes Spinach, Amaranth, Leafy onion, Coriander and Fenugreek. The fungal diseases identified on spinach leaves are *Cladosporium* leaf spot, *Stemphyllium* leafspot, *Colletotrichum* anthracnose, and Downy mildew. Amaranth leaves diseases are *Albugo* white rust, *Peronospora* downy mildew and *Colletotrichum* anthracnose. Fenugreek diseases visible in this area are *Cercospora* leaf spot, *Erysiphe* powdery mildew, and *Alternaria* leaf spot. Onion leaf shows three diseases they are *Stemphyllium* spot, *Alternaria* blotch and *Cercospora* leaf spot.

Keywords: - Preharvest, Post-harvest, Amaranth

Introduction: -

Fibres and vitamin C are the main constituent of leafy vegetables, which enhances its demand among village and city areas. The study on Amaranth and other was done by Lawal (2015) clearly indicate fresh vegetable is a source of Vitamin C. various spinach diseases was studied by Correll *et al.*(1994) under heading of research paper, Economically important diseases of spinach. Leafy onion diseases like *Alternaria porri* and *Stemphyllium vesicarium* was studied by Suheri and Price (2000) Dongre and Borse (2015). Economic loss of onion by infection of *Alternaria* causing purple blotch were recorded by Gupta and Pathak (1988). Saharan and Lakra 1988 reported *Albugo* on Oilseed plant from Haryana, India. L.J.du Toit and C.M. Ocamb describe Spinach *Stemphyllium* leaf spot and stated *Stemphyllium botryosum* first reported from California in 1997 on spinach plant. Description about downy mildew from India given by Thakur and Mathur (2001). Vegetable markets are the places where these are commonly placed for sell. They are full of moisture and nutrients and hence easily attacked by Fungi and Bacteria. The disease may be preharvest or postharvest in nature. Preharvest diseases are parasite but after harvesting saprophytes are common. Both preharvest and post-harvest fungi related pathogens are selective for host. Like *Alternaria* infect most postharvest vegetables but species or variety is different.

Material and Methods: -

Vegetables are collected from daily market of Dhule city and weekly markets of surrounding area of Dhule. The suspected samples of vegetables are collected and on the same day they are examine for related fungal pathogen. Microscopy using temporary slide preparation of sample with lactophenol and cotton blue. Sometimes the vegetables are kept in moist chamber to proliferate the growth of fungi.

Identification of fungi relate with disease with the help of hyphal and conidial morphology seen under microscope. Confirmation of pathogen identification was done by using literature available online and offline. Few books like Plant pathology by George N. Agrios (1969), Ellis, M. B. (1971), Paul and Thakur (2006) and others relevant literature are helpful.

Chance of occurrence / Percentage contribution of Disease Pathogen

Contribution of pathogen represent its chances of occurrence on specific host for specific area. For calculating % contribution following equation we use here.

$$\% \text{ Contribution of disease Pathogen} = (N1/N) \times 100$$

Here N1-numer of times Cladosporium associate with vegetable

N- sum total of numbers of incidence of all diseases for specific host

Spinach: -

Easily available leafy vegetable. Cooked singly or in combination with others. This vegetable belongs to family *Chenopodiaceae*. Botanical name *Spinacia oleraceae* and common name Palak.

Four pathogens are recorded from this area. Among these *Cladosporium* is more severe and cause leaf spot disease. Followed by *Stemphyllium* and *Colletotrichum*. Preharvest obligate parasite like *Peronospora* is also seen during collection.

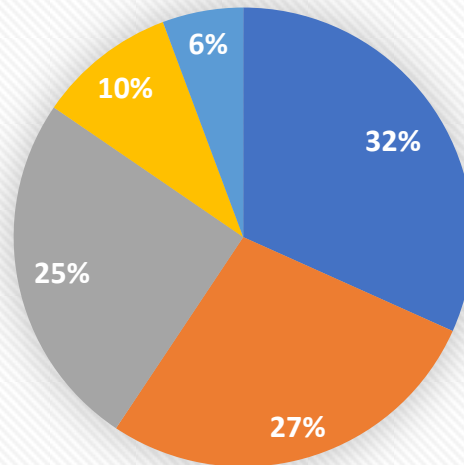
Table1 :- Spinach diseases and causal organism identified from Market

Sr. No	Host	Pathogen	Nature of pathogen	Disease
1.	Spinach	<i>Cladosporium variable</i>	Opportunistic parasite	Leaf spot
2.		<i>Cercosora beticola</i>	Parasite	Leaf spot
3.		<i>Stemphyllium botryosum</i>	Opportunistic parasite	Leaf spot
4.		<i>Colletotrichum spinaciae</i>	Opportunistic parasite	Anthraxnose
5.		<i>Peronospora spp.</i>	obligate Parasite	Downy mildew

Table 2:- Disease contribution % for identified pathogen on Spinach

Sr. no	Total numbers of visit for collection	Name of Pathogen	Number of times pathogen reported	% contribution of pathogen
1	100	<i>Cladosporium variable</i>	39	31.708%
2	100	<i>Cercosora beticola</i>	34	27.642%
3	100	<i>Stemphyllium</i>	31	25.203%
4	100	<i>Colletotrichum spinaciae</i>	12	9.757%
5	100	<i>Peronospora spp.</i>	07	5.691%
<i>Total number of times pathogen found</i>			123	

Contribution for Spinach market diseases



■ Cladosporium variable ■ Cercosora beticola ■ Stemphyllium
 ■ Colletotrichum spinaciae ■ Peronospora spp.

Fenugreek: -

Common vegetable seen in market. This vegetable belongs to family *Fabaceae*, botanical name *Trigonella foenum-graecum*. Four fungal pathogens are reported for fenugreek vegetable. They are *Alternaria alternata*, *Cercospora traversiana*, *Erysiphae spp.*

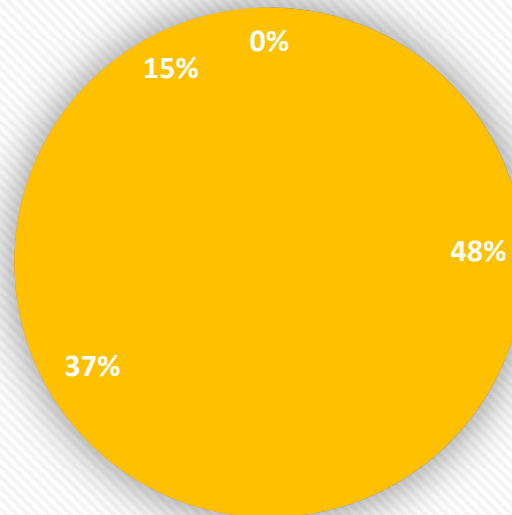
Table1 :- Fenugreek diseases and causal organism identified from Market

Sr. No	Host	Pathogen	Nature of pathogen	Disease
1.	Fenugreek	<i>Alternaria alternata</i>	Opportunistic parasite	Leaf spot
2.		<i>Cercosora traversiana</i>	Opportunistic parasite	Leaf spot
3.		<i>Erysiphae spp.</i>	obligate Parasite	Powdery mildew

Table 4:- Disease contribution % for identified pathogen on Fenugreek

Sr. no	Total numbers of visit for collection	Name of Pathogen	Number of times pathogen reported	% contribution of pathogen
1.	100	<i>Alternaria alternata</i>	26	48.148%
2.	100	<i>Cercosora traversiana</i>	20	37.037%
3.	100	<i>Erysiphae spp.</i>	08	14.815%
<i>Total number of times pathogen found</i>			54	

Contribution for Fenugreek market diseases



■ Cladosporium variable ■ Cercosora beticola ■ Stemphyllium ■

Amaranthus: -

Common name Pokala Tandalaja bhaji, etc available in every vegetable market of Dhule and surrounding area throughout year. It belongs to family *Amaranthaceae*. Three diseases are seen on this vegetable. They are *Albugo* (white rust), downy mildew caused by *Peronospora amaranthi* and anthracnose by *Colletotrichum gloeosporioides*.

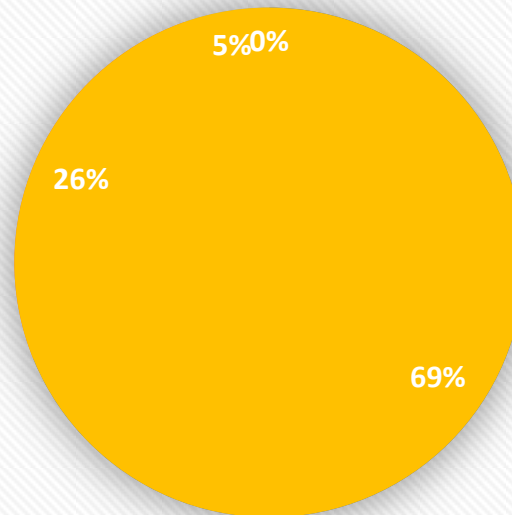
Table5 :- *Amaranthus* leafy vegetable diseases and causal organism identified from Market

Sr. No	Host	Pathogen	Nature of pathogen	Disease
1.	Amaranthus	<i>Albugo candida</i>	obligate Parasite	White rust
2.		<i>Peronospora amaranthi</i>	obligate Parasite	Downy Mildew
3.		<i>Colletotrichum gloeosporioides</i>	Opportunistic parasite	Anthracnose

Table 6:- Disease contribution % for identified pathogen on *Amarathus* leafy Vegetable

Sr. no	Total numbers of visit for collection	Name of Pathogen	Number of times pathogen reported	% contribution of pathogen
1.	100	<i>Albugo candida</i>	64	68.818%
2.	100	<i>Peronospora amaranthi</i>	24	25.807%
3.	100	<i>Colletotrichum gloeosporioides</i>	05	5.377%
<i>Total number of times pathogen found</i>			93	

Contribution for Market Amaranth diseases



■ Albugo candida ■ Peronospora amaranthi ■ Colletotrichum gloeosporioides ■

Leafy onion:- Khandesh area is one of top grower of onion. The peoples using both leaves and onion bulbs in their daily uses. The local market always shows the presence of this vegetable. This vegetable belongs to family *Amaryllidaceae* with botanical name *Allium cepa*.

Three pathogens are clearly making their presence in diseases, they are *Alternaria porri*, *Cercospora duddiae* and *Stemphyllium vesicarium*,

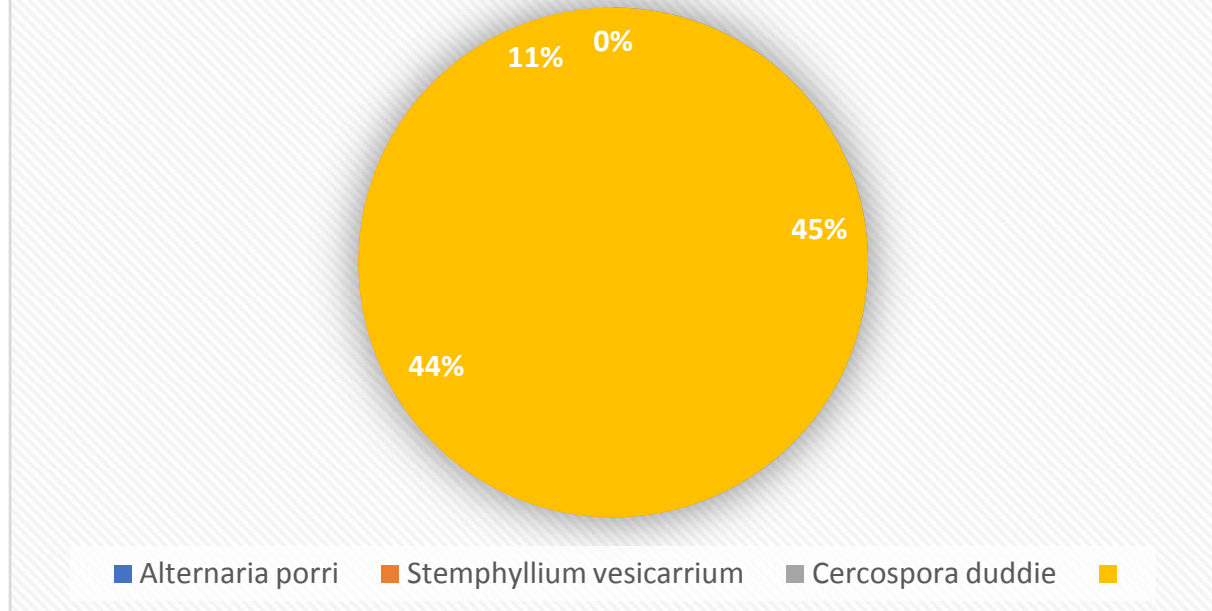
Table7 :- Leafy Onion diseases and causal organism identified from Market

Sr. No	Host	Pathogen	Nature of pathogen	Disease
1.	leaves	<i>Alternaria porri</i>	Opportunistic parasite	Leaf blotch
2.		<i>Stemphyllium vesicarium</i>	Opportunistic parasite	Leaf blotch
3.		<i>Cercospora duddie</i>	Opportunistic parasite	Leaf spot

Table 8- Disease contribution % for identified pathogen on Leafy Onion

Sr. no	Total numbers of visit for collection	Name of Pathogen	Number of times pathogen reported	% contribution of pathogen
1.	100	<i>Alternaria porri</i>	86	44.791%
2.	100	<i>Stemphyllium vesicarium</i>	84	43.75%
3.	100	<i>Cercospora duddie</i>	22	11.459%
<i>Total number of times pathogen found</i>			192	

Contribution for Market Leafy onion diseases



Conclusion: -

The survey for market vegetable diseases for a year surrounding an within Dhule area. There are four leafy vegetable which is popular and easily available are Spinach, Fenugreek, Amaranth and leafy onion. The fungal parasite found on spinach are *Cladosporium variable*, *Cercosora beticola*, *Stemphyllium botryosum*, *Colletotrichum spinaciae* and *Peronospora spp.* The % frequency calculated shows the contribution of each pathogen in the market for that host vegetable. Spinach shows contribution of *Cladosporium variable*, *Cercosora beticola*, *Stemphyllium botryosum*, *Colletotrichum spinaciae* and *Peronospora spp.* is 31.708%, 27.642%, 25.203%, 9.757% and 5.691% respectively.

Fenugreek shows infection of *Alternaria alternate*, *Cercosora traversiana* and *Erysiphe spp.* in this region and their contribution in market diseases was 48.148%, 37.037% and 14.815% respectively.

Amaranth leafy vegetables are also found for selling purpose in every market of this area. This vegetable shows three diseases caused by *Albugo candida*, *Peronospora amaranthi* and *Colletotrichum gloeosporioides*, the contribution percentage for these pathogens are 68.818%, 25.807% and 5.377% respectively.

The fourth leafy vegetable found most abundantly is leafy onion or onion leaves. here we found three diseases associated with this vegetable, they are *Alternaria porri*, *Stemphyllium vesicarium* and *Cercospora duddie* and their contribution was found to be 44.791%, 43.75% and 11.459% respectively.

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