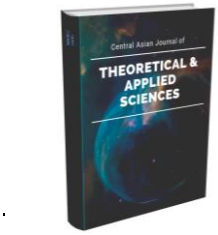

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Article

Black mold fungal disease that affects some vegetable and fruit (literature Review)

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Abstract: Aspergillus genus containing many species which considered one of the most fungal disease involving plant, Fruit and vegetable conceded one of the biggest source of fibers ,minerals and vitamins providing human being with energy ,enhancing health and youth of skin ,decreasing cardiac disease , Black mold mostly involving plat during warm condition especially during storage when suitable condition for growth of fungi occure even after harvest ,black mold disease can involve many fruit &vegetable , initial symptoms of infection appear on the top of the plant in the form of black spots or lines around the top or on the sides or the entire plant like the onion plant and garlic also involving fruit like the grape, apple and pomegranates as well as producing toxin (mycotoxin) that causing contamination effect of agricultural plant, as Aspergillus strain can producing toxin known as aflatoxin which had positioning effect to human after ingestion of infected food ,disease by aspergillus increased over the year so that this review focused on some causes and main plant involved by aspergillus spp. With some available application to reduced this

Keywords: black mold; fruit ,vegetable ,aspergillus spp.

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1. Introduction

Earlier, the complex of fibers, minerals and vitamins, familiar to every person, is obtained primarily from fruits and vegetables, which are of great importance to human's health. They are used to supply the body with energy, help to nurture the skin coming back to its youth and improve the health, and_quit_ undermining the body coming with different chronic diseases. There is evidence that reveal a inverse correlation between the regular consumption of fruits and vegetables and cardiac diseases, cerebral strokes and effects of constipation. These natural food sources are basic necessities in physical health and in achieving proper diet in ones lifestyle.

Tomatoes and potatoes are special among vegetables because both contain a high mineral and potassium. Potassium is micronutrient that is involued in various physiological activities within the human body. The mineral can also be found in vegetables like tomatoes and potatoes with the function of blood pressure regulation and control since it has the diuretic effect. It is also used for treatment of cardiac arrhythmias, muscle spasms, and for maintaining normal adrenal cortex function. The lack of potassium in the body affects health by causing chronic diarrhoea, vomiting, muscle weakness and

adrenal gland disorders. Therefore, eating optimum quantities of potassium containing vegetables must be taken in order to support the cardiovascular system and the body in general. The consumption of an appropriate quantity of fruits and vegetables is equally important for weight management and increasing life expectancy. These foods are not only low in calories but also rich in antioxidants, which help combat oxidative stress in the body. Antioxidants play a vital role in reducing the risk of chronic diseases such as cancer by boosting the immune system. Additionally, fruits and vegetables are an excellent source of folic acid, which supports cell growth and repair and helps reduce the risk of certain types of cancer. Regular intake of these nutrients contributes to improved immunity and overall vitality.

It is also noteworthy that the natural sugars present in fruits, such as fructose, are more beneficial and healthier than refined white sugar. Fructose is easily digested and provides the body with a quick and sustainable energy source without the harmful effects associated with high sugar consumption. This makes fruits an ideal alternative for satisfying sweet cravings while providing additional health benefits. Overall, the inclusion of a diverse range of fruits and vegetables in the diet is essential for optimal health, offering protection against diseases, promoting physical and mental well-being, and improving the quality and longevity of life.

1-2. Aspergillus Fungus

The genus of aspergillus was first catalogued in the 1729 by the Italian biologist Pier Antonio Micheli viewing the fungi under microscope [6].its contains many species,A.niger and A.flavus one of most pathogenic plant disease in this study affecting plant after harvest, by black mold disease of vegetable and fruits [7] .

Is the classified according to Micheli ex Haller (1768) [8] as Domain: Eukaryota ,Kingdom: fungi Division: Ascomycota, Class: Eurotiomycetes, Order: Eurotiales,Family:Aspergillaceae ,Genus :Aspergillus , Involvement of host plant occur when there is defect in the surface [9] permit hyphal penetration then colonization of plant as aspergillus disease one of opportunistic pathogen changing physiology of plant [10,11]

2. Materials and Methods

Morphology and molecular identification of black mold fungal disease that damages many vegetables and fruits use laboratory and field techniques for detection of the pathogen, disease development, and assessment of control measures. In most cases, the pathogen is first being cultured from infected plant tissues sampled from different fields of agriculture. For identification of those organisms, grown on selective media like Potato Dextrose Agar, they study basic techniques of microbiology- morphological characteristics including looking at the spore formation in Aspergillus niger. Molecular biotechnology is used to increase specificity where PCR is used and specific primer are used on fungal internal transcribed spacer one and two regions. These methods are sometimes supported by phylogenetic analysis that helps to define the exact pathogen.

In natural disease progression experiments conducted under laboratory or greenhouse conditions, pathogenic fungal inoculum is introduced into otherwise healthy plant parts to assess disease expression including lesion formation and spore yield. Temperature, humidity, and light are some of environmental variables examined in terms of their effects on disease outcomes usually by surveys conducted in the field and statistical analysis. By screening the different cultivars of vegetables and fruits, then the researcher gets to learn the resistance of the plants based on the outcome of the diseases and the effect on yield and quality.

Functions are assessed by IPM methods, comprising fungicides, organism biocontrol such as Trichoderma, and cultural control like crop rotation and irrigation. These

experiments are important because black mold is most likely to attack after the harvest; during these experiments, the researchers mimic storage conditions and investigate the influence of temperature and humidity, as well as the packaging on fungal development. The microstructure of the pathogen plant cell interface is observed under the scanning electron microscope while tissue degeneration and fungal invasions are studied using tissue staining techniques.

Data collected from these methods are analyzed using statistical tools such as regression analysis and multivariate analysis to identify patterns and predict disease outbreaks. Geographic Information Systems (GIS) further aid in studying disease distribution. Together, these approaches provide a comprehensive understanding of black mold fungal disease, facilitating the development of effective management strategies to mitigate its impact on agricultural production and postharvest storage

3. Results and discussion.

1-3.Black mold Plant Diseases

Black mold mostly involving plat during warm condition especially during storage as 20 to 40 °C considered suitable condition for growth of fungi, [12] symptom appear as black discoloring and dark lesion [13],black conidial masses on the bulbs and on plant surface [14] as in figure (1).

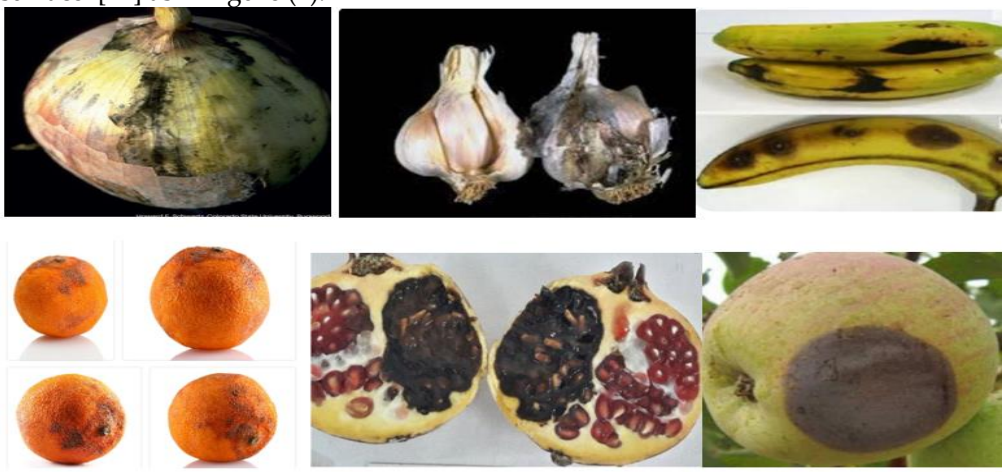

Figure (1) appearance of some involved vegetable and fruit by black mold disease.

The fungi lived in decayed plant and debris for a lot of time waiting for suitable condition for growth[15,16]. Black rot commonly occurs after harvest, affecting stored fruits and can also occur in the field when bulbs are in the final stages of maturity [17,18] .The initial symptoms of infection appear on the top of the plant in the form of black spots or lines around the top or on the sides or the entire plant as black spot,[19]then it moves to invade inter plant [20] .

Table (1) types of black mold species in fruit and vegetable

Fruit &vegetable	Family	Scientific name	Aspergillus spp.
Apple	Rosaceae	Malus domestica	*A.niger*
Banana	Musaceae	Musa paradisiacal	*A.niger*
Orange	Rosaceae	Citrus sinensis	*A.niger* ,*A.flavus*
Straw bey	Rosaceae	Fragaria x ananassa	*A.niger* , *A.flavus*

Pomegranate	**Pinaceae**	**Punica granatum L.**	***A.niger***
Potato	**Solanaceae**	**Solanum tuberosum**	***A.niger***
Onion	**Alliaceae**	**Allium cepa**	***A.niger***
Peper	**Solanaceae**	**Capsicum annuum**	***A.niger***
Garlic	**Alliaceae**	**Allium sativum**	***A.niger***
Tomato	**Solanaceae**	**Lycopersicon esculentum**	***A.niger***

1-4.Effect of ingested contaminated plant

Aspergillus strain can producing toxin known as aflatoxin which had positioning effect to human after ingestion of infected food [21,22] ,Also inhalation of spores can lead to lung diseases especially in immune compromised peoples like patient with cancer ,diabetic or had blood disease [23].If Amount of contaminated foot by aflatoxin is low risk on human is decreased as humen body can get rid of these toxin through the liver however chronic exposure to it for long time leading to damaged immune system ,chronic liver disease ,and liver cancer [24]while high level contamination can leading to sever poisoning effect may causing death especially in children and old people [25]

2.Controlling of black mold disease

1.Chemical control: Using a suitable fungicide to reduces the spread of the disease.

2.Organic control: Storing and transporting fruits at temperatures below 15°C and in low humidity. Installing a good drainage system in the field also helps slow the growth of fungi.

2-1.Preventive measures for black mold disease on plant

The main preventive measure done by removing involved plant during storage and ensure a good drying of plant to decreased humidity effect ,Be careful when handling the plant during harvest handling and transportation to reduce wounds to avoid infection with the fungus, Good fertilization enhances the plant's resistance to the disease. Sterilize agricultural tools before use. Install a good irrigation and drainage system to reduce soil moisture

4. Conclusion

Aspergillus spp. affected mold plant disease become a threat for agricultural industry especially fruits and vegetable under certain conditions. These molds prefer warm and humid areas hence poor methods of storing foods contributes to the creation of these molds. While Aspergillus spp. on fruits and vegetables is a problem that impacts produce quality and safety, it can have dire consequences on consumers. This disease may cause the formation of toxic substances as mycotoxins inclusive of aflatoxins that is known to caused liver diseases, suppressed immune system, and cancerous diseases. Therefore, fruits and vegetables get affected by diseases, become non-";///uitable for human consumption and this creates major losses as farmers, distributors and retailers lose their stocks.

Mold plant disease also has indirect effects on the economy through losses from damaged produce apart from traditional costs. Contaminated shipments may be refused

in the international trade, which may lead to a decline in a countries agricultural exports, as well as eradicating producers' credibility. Also, the funds used in nurturing and cultivating such crops, harvesting them and marketing are equally lost as a result of the damage. This highlights the importance of prevention and management strategies in reducing these risks in the best way possible. Environmental control conditions are of importance in minimizing the spread of Aspergillus spp. Mold is most likely to form on fruits and vegetables and this can be prevented by making sure the product is stored in a cool, dry and well aerated place. Adequate monitoring of storage facilities to detect precursors of mold growth and proper control of temperatures and humidity in the storage areas can help minimize the mold risk greatly. Both timely removal of contaminated or spoiled product and timely cutting off of mold infection to healthy portion of the plant is crucial. This step is important more so in large refrigerated storage facilities where contamination is likely to be severe due to continued storage.

one of the essential factors to consider while managing this disease is how to avoid passage of the contaminated produce to the consumers. Policies that would help avoid contamination are to conduct proper measurements on quality control when harvesting; proper processing procedures; and distribution of fresh un-contaminated produce. Another strategy on the ways of dealing with Aspergillus associated plant diseases is through improved public awareness to discourage farmers, distributors and consumers, from growing, handling or consuming products which are contaminated with this mold.

Therefore, mold plant disease on crops by Aspergillus spp. is a major threat to life and agriculture returns in the society. Through improving the storage methods, promptly disposing of processed produce that has been contaminated with the disease, and protecting the disease from reaching the consumers, it can be possible to manage this disease in the right manner. Due to the nature of this challenge, its containment depends upon farmers, storage facility owners and providers, distributors, and policy makers for the safety and quality of fruits and vegetables in the global food chain.

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