

FUNGAL INFECTIONS AND INFESTATIONS OF VEGETABLES FROM KARACHI MARKET

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A survey, to study the various fungi present on vegetables sold in Karachi markets, was conducted. Potato, tomato, spinach, garlic, onion, peas, chillies, ginger and methi etc., collected from six different and far apart vegetable markets, were found to be infected or infested with *Aspergillus niger*, *Alternaria* sp. *Fusarium solani*, *Cercospora beticola* and *Rhizopus nigricans* etc. Most prevalent among the fungi isolated were *Aspergillus niger* and *Alternaria* sp.

Introduction

Investigations in the last few decades have shown that potatoes, tomatoes, peas, beans, carrots, radish, turnip and beets were found to be infected with rots, blights, canker, wart, crown gall, grey mold, leaf spot and mildews.¹ Hafeez and Hasan² have prepared a chart for general information of agriculturists describing diseases of vegetables. In the present study, therefore, a more specific and detailed survey of various fungi present on the vegetables sold in the Karachi markets has been made in order to ascertain the losses caused by them and also to suggest some possible control. Another aim of this study was to acquire acquaintance with the fungus flora of local vegetables and to use these isolates as test organisms for carrying out fungicidal evaluations of indigenous materials.

Materials and Methods

Samples of vegetables from six different places, Nazimabad, Jail Road, Landhi, Jamshed Road, Ranchore Lines and Empress Market, were collected at different times of the year. Each sample was kept in a pre-cleaned polyethylene bag to avoid any contamination.

At the time of collection, the characteristic disease symptoms of fungal infection if any were noted. The samples were examined directly under dissecting microscope to observe the type of infections. Infected portions were implanted on solidified Czapek-Dox agar medium, with an acidic pH to eliminate bacteria. Some of the pieces were implanted after sterilizing the surfaces with mercuric chloride (1:1000) solution for 1/2, 1 and 2 minutes, although use of 70% alcohol has also been suggested by some workers.³

For excising and implanting the diseased materials of vegetables, the scissors, scalpels, needles, and forceps were sterilized by dipping in methylated spirit and flaming several times. Usually

three pieces from each specimen were inoculated in one petri plate and the growth observed after 24 hours of incubation at 28°C. Control plates (without any vegetable pieces) were also used simultaneously.

Results and Discussion

Potato (Solanum tuberosum L.).—Samples of infected potatoes, sometimes having some apparent injury, were collected from all the places visited (Fig. 1.). Characteristic white colonies of *Fusarium* sp., appeared in all petri plates inoculated with diseased pieces of tomato. Branched and septate mycelium along with typical sickle or crescent shaped and hyaline macroconidia as well as microconidia were observed. *Fusarium* is very notorious in attacking potatoes.^{1,4-6}

Tomato (Lycopersicon esculentum L.).—Like potato, tomato is also attacked by a number of pathogenic fungi. Three different fungi were isolated from the surface of the collected specimens. The fungi, *Aspergillus niger*, *Rhizopus nigricans* and *Alternaria* sp., were found on the surfaces as forming a definite greenish patch somewhat round in shape and at lower-half portion of the fruit. *R. nigricans* causes a soft rot, a ripe fruit-rot and is prevalent in many other types of plants. It penetrates through wounds and the decay is very rapid at room temperature. This disease chiefly occurs in storage and transit⁷ but may also occur occasionally in the field.

Spinach (Spinacia oleracea L.).—It is one of the most commonly consumed vegetable, very sensi-

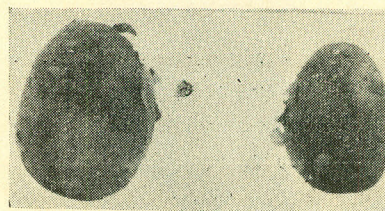


Fig. 1.—Potatoes infected with *Fusarium* sp. Note wrinkles on surface.

tive to high acidity. Bacterial soft-rot, damping off, root-rot, mildews, rusts and wilts are some of the severe diseases of this plant. Small necrotic spots were present on the collected specimens, scattered all over the surface of the leaves (Fig. 2). The necrotic lesions were excised, crushed, and examined under the microscope. Typical elongated, hyaline, conidia of *Cercospora* sp. were seen. This spot-causing fungus has been reported as *C. beticola* Sacc., but due to differences in the structure of the spores, the fungus attacking spinach has been given a different name by Halsted⁸ as, *C. flagilliformis* Ell & Halst.

Downy mildew, White rust, *Heterosporium* leaf spot,⁹ were not observed on the plants collected.

Onion (*Allium cepa* L.).—Onion is subjected to a large number of parasitic and nonparasitic maladies, some of which are widely spread and destructive in nature like the bacterial soft-rot.¹⁰ Approximately all the specimens collected, showed characteristic black powdery mass of *A. niger* V. tiegh spores on the exterior surface of the scales. The spores were not confined to upper scales only but were also found on the exterior of the inner scales as well and could be easily rubbed off (Fig. 3).

An interesting feature of the black mold fungus, as reported by Haffield *et al.*¹¹ is that the onion extract which is toxic against a number of fungus

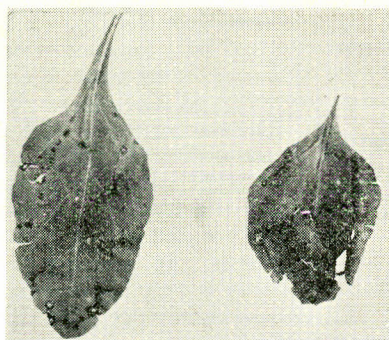


Fig. 2.— Spinach leaf showing characteristic necrotic spots of *Cercospora* sp.

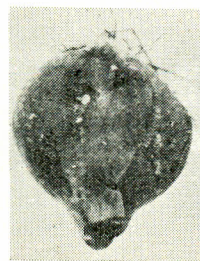


Fig. 3.— Onion bulbs showing masses of *A. niger* spores.

spores, has growth-stimulating effect on it. This results in profuse and luxuriant growth of the conidiophores and conidia on onion bulbs.

Samples of onion with green leaves were also examined but no fungi were found infesting or infecting them.

Garlic (*Allium sativum* L.).—Like onion, samples of garlic were also found to be heavily attacked by *A. niger* (Fig. 4). Sometimes portions of the bulbs were found to be completely converted into a mass of black spores. The inner scales of the bulb were also infected and contained masses of spores.

Garlic is subjected to attacks by a number of fungal species under varied environmental conditions. Thus the blue mold attacks the bulb of garlic most commonly during storage. *Cercospora* leaf-spots, soft-rot, purple-blotch, leaf-mold and *Helminthosporium* blights are some of the very common diseases of garlic.

Pea (*Pisum sativum* L.).—All parts of the pea plant, right from root to the pods are susceptible to a large number of pathogenic micro-organisms, specially fungi. Bacterial blights, *Aphanomyces*, *Fusarium* root-rots, *Pythium* disease, downy mildew, leaf-spots, black-leaf, scab and wilts are amongst the diseases of much economic importance.

The pods collected showed small blackish spots (Fig. 5), which were examined and planted on Czapek-Dox medium. The seeds were also planted. *Rhizopus nigricans* and *Alternaria* sp. were isolated from the inoculated pods surface and seeds. None of the two fungi have been reported as pathogenic to peas. The organisms

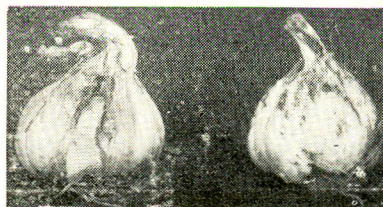


Fig. 4.— Garlic bulbs showing heavy infection of *A. niger*.

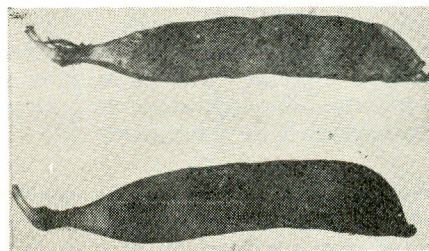


Fig. 5.— Pea pods infected with *Alternaria* sp.

thus might have infested the plant during transportation or storage.

Carantia (*Mommardica carantia* L).—A species of *Fusarium* was isolated from green carantia fruit. The specimen was collected from Jail Road only. The damage to fruit was not very serious. When a piece of the infected surface was inoculated typical *Fusarium* growth was obtained.

Ginger (*Zingiber officinale* R), *Chillies* (*Capsicum annum* L.), *Methi* (*Trigonella foenum-graceum*).—From the surface of ginger, chillies and methi, *Aspergillus niger* was isolated. Chillies have been reported to suffer from two diseases, die-back and mosaic, a fungal and a viral disease respectively.

Coriander (*Coriandrum sativum* L).—Blackened coriander leaves were teased, observed and inoculated in Czapek-Dox medium. Species of *Alternaria* and *A. niger* were isolated from the samples brought from Landi colony and Jail Road respectively. Hafeez and Hasan² have reported formation of tumor-like swellings on various parts of flower and stalk.

Besides the above-mentioned vegetables a number of other vegetable plants like, brinjal, cabbage, cauliflower, tinda, turnip, beets, radish, carrots, beans and a host of others were also collected but nothing notable was isolated from any of them.

Among the various types of fungus spp. *A. niger* was found to be the most common organism prevalent on various types of vegetables, as this fungus can grow under extreme conditions of pH, temperature and humidity. The other organism was *Alternaria* sp. which is again a very common soil and air borne fungus and can survive under quite contrasting conditions. As regards other fungi, they infect or infest the vegetables at various stages of transportation, storage and marketing.

In our studies more emphasis is given to the diseases rather than the taxonomic studies of the casual organisms involved. No description or the detailed account of the fungi, therefore, has been given.

Control.—Since we are dealing with the problem at such a stage where conventional methods such as spraying, seed dressing etc. cannot be applied, the only means applicable is either to completely avoid the use of the diseased vegetables or at least to excise the infested or infected parts. Although the various types of fungal species isolated have little pathogenicity for man, there are a number of other organisms, like bacteria and viruses, that can cause various human diseases.

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