

## Effect of Temperature and Humidity on Seed Mycoflora of Charoli and Almond, India

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### Abstract

The present investigation deals with growth of various types of fungi on the seed of charoli and almond at different temperature and humidity levels. For such assessment seeds of charoli and almond were kept in different temperature ranging from 10<sup>o</sup> to 40<sup>o</sup>C and also at different humidity level ranging from 54% to 94%. Many species of fungi were found on seed coat of charoli and almond, but among them predominant were *Aspergillus* and *Rhizopus*.

**Keywords:** Charoli, almond, aspergillus, rhizopus, drupe.

### Introduction

Scientific name of charoli is *Buchanania lanzan*. They are tiny almond-flavoured dried seeds of a bush. Charoli mainly grows in tropical region of India and it is an endemic<sup>1</sup> as well as vulnerable plant. Flowering season is from January to March. It is cultivated across India, primarily in the northwest. The roots of charoli gives cooling effect and are useful in treatment of diarrhea. Skin diseases can be cured with its leaves. Fruits are used in treating cough and asthma. It grows on yellow sandy-loam soil and is a commercially useful tree species throughout the greater part of India.

Scientific name of almond is *Prunus amygdalus*. It is not a true nut, but a drupe. Flowering season is from March to April. Global production is approximately 1.7 million tones. Almond is actually a native of Central Asia is now cultivated throughout Southern Europe, USA, Australia and South Africa. They are rich source of fats, protein, carbohydrate and mineral matter.

Preliminary research showed that intake of almond creates lower risk of cancer and also improves complexion. Almond oil has been traditionally used by massage therapists for the skin.

There are reports where seed borne fungi affect the yield of crop, its production and changes the food nutrition value and also causes disease. During the stages of maturity or harvesting and storage, the seeds get exposed to high level of humidity and temperature fluctuations and hence develop several kinds of moulds which spoil these seeds<sup>2</sup>.

The growth of fungi is directly proportional to optimum temperature. As the temperature increases fungal growth also increases. Similarly growth of fungi is also directly proportional to humidity. As humidity increases, fungal growth increases.

In almond and charoli seeds fungi can be detected in - Shell, Seed coat, Cotyledon, Axis.

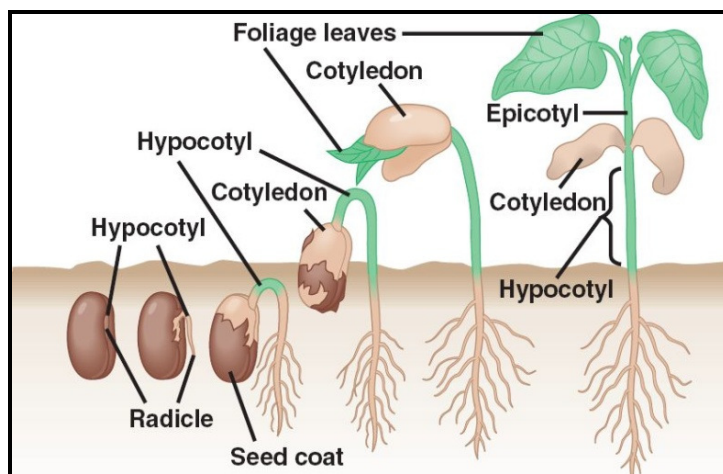
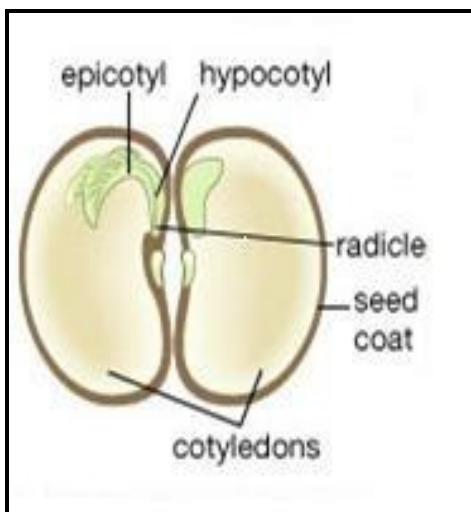


Figure-1  
Parts of seed



**Figure-2**  
 Cross section of a seed

**Material and Methods**

16 petriplates were collected and they were autoclaved. Four layers of blotting paper were kept on each other in petridish<sup>3</sup>. These blotting papers were soaked in distilled water for 20 minutes at a pressure of 15 psi. Some charoli and almond were placed on wet blotting paper in this petriplate.

Out of these, 4 petriplate containing almond and 4 petriplate containing charoli were kept in BOD incubator and temperature of 10<sup>0</sup>C, 25<sup>0</sup>C, 35<sup>0</sup>C and 45<sup>0</sup>C was maintained for 5 days. Fungal colonies start appearing after 24 hours<sup>4</sup>. The seed mycoflora varied significantly qualitatively and quantitatively with the temperature conditions. Fungi like species of *Aspergillus* and *Rhizopus* were found to be associated with the seeds at all temperatures. Minimum fungal incidence occurs at 10<sup>0</sup>C and maximum occurs at 35<sup>0</sup>C. Fungal growth increases with the increase in temperature to a certain extent, then the thermophilic fungi starts growing<sup>3</sup>.

Another 4 petriplate containing almond and 4 petriplate

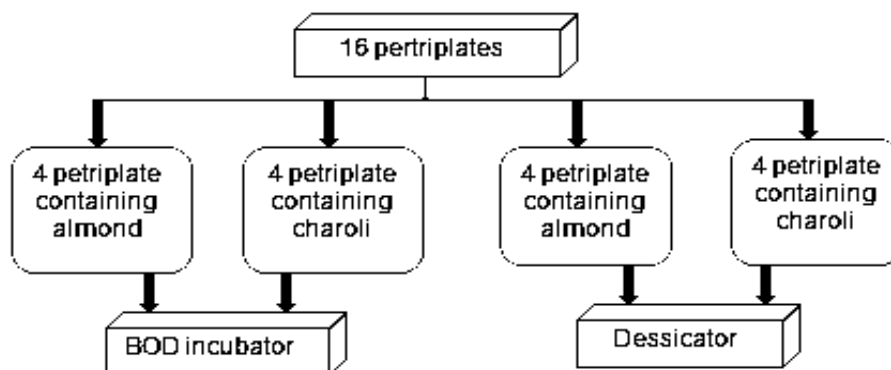
containing charoli were placed in dessicator and relative humidity of 94%, 84%, 74% and 54% was maintained by different solutions for 5 days. The seed mycoflora varied significantly qualitatively and quantitatively with the humidity conditions. Fungi like species of *Aspergillus* and *Rhizopus* were found to be associated with the seeds at all humidity. Presence of these species at low RH may be attributed to their xerophilic nature, while their dominance at high RH may be due to their strong saprophytic ability<sup>5</sup>. Minimum fungal incidence occurs at 54% RH and maximum occurs at 94% RH. It was observed that the growth of fungi increased with the increase in moisture level.

Major species of fungi found in charoli and almond seeds were *Aspergillus*, *Fusarium*, *Penicillium*, *Curvularia*.

**Aspergillus:** Conidiophores are simple, straight, having globose or clavate swelling, bearing phialides at the apex or radiating from the entire surface. Conidia are single celled, globose, often variously coloured in mass, catenulate and produce basipetally. A large genus are present containing many species saprophytic on a wide variety of substrate and a few parasitic species<sup>6</sup>.

**Fusarium:** Extensive mycelium and cottony in culture, often with some tinge of pink, purple or yellow. Conidiophore are variable, slender and simple or snout, short, branched irregularly. They can bear phialids which are in spiral shape, single or grouped into sporodochia. Conidia are translucent, variable and often held in a mass of gelatinous material. 2 types of conidia – macro and micro conidia. They are parasitic on higher plants or saprophytic on decaying plant<sup>6</sup>.

**Penicillium:** Species of penicillium are omnipresent soil fungi which grow in moderate to cool weather, wherever organic material is present. The vegetative part of penicillium typically consists of colorless hyphae which are multi nucleate having many branches. Many conidiophores grow on the mycelia, bearing individually constricted conidiospores. Dispersion of fungi occurs through these conidiospores, which are usually green.



**Figure-3**  
 Flow chart of the experiment done

**Curvularia:** Conidiophore brown, simple or sometimes branched. Spore bearing as in helminthosporium. Conidia are fusiform in shape, lighter towards end, dark in colour, 3 to 5 celled, little bent or curve with 1 or 2 of the central cells enlarged. Conidia is distinguished by distinctly septate lines which is brown in colour. They may be parasitic or saprophytic. They are found in tropical as well as in temperate zone.

### Results and Discussion

4 petriplate containing almond and 4 petriplate containing charoli were kept in BOD incubator and temperature of 10°C (figure-4 and 5), 25°C (figure-6 and 7), 35°C (figure-8 and 9) and 45°C (figure-10 and 11) was maintained for 5 days.



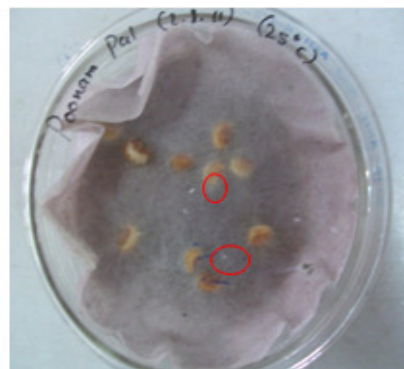
**Figure-4**  
Petriplate containing almond kept at 10°C



**Figure-5**  
Petriplate containing charoli kept at 10°C



**Figure-6**  
Petriplate containing almond kept at 25°C



**Figure-7**  
Petriplate containing charoli kept at 25°C



**Figure-8**  
Petriplate containing almond kept at 35°C



**Figure-9**  
Petriplate containing charoli kept at 35°C

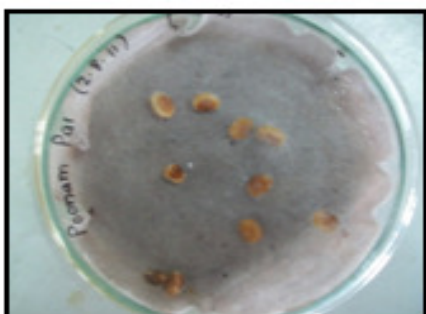


**Figure-10**  
Petriplate containing almond kept at 45°C



**Figure-11**  
 Petriplate containing charoli kept at 45°

Another 4 petriplate containing almond and 4 petriplate containing charoli were placed in dessicator and relative humidity of 94%, 84%, 74% and 54% was maintained by different solutions for 5 days, figure-12 and 13.



**Figure-12**  
 Petriplate containing charoli kept in dessicator



**Figure-13**  
 Petriplate containing almond kept in dessicator

### Conclusion

After considering the above results it is concluded that most of the fungi were found to be located on seed coat. Maximum incidence of fungal growth was observed at a temperature of 25 - 30° C and at a humidity level of 94%. Minimum was observed at relatively cold temperature (10° C) and low humidity level. Fungi like species of *Aspergillus* and *Rhizopus* were predominant and were found to be associated with the seeds at all temperatures and humidity level.

These all factors need to be considered at the time of storage of dry fruits / seeds of charoli and almond.

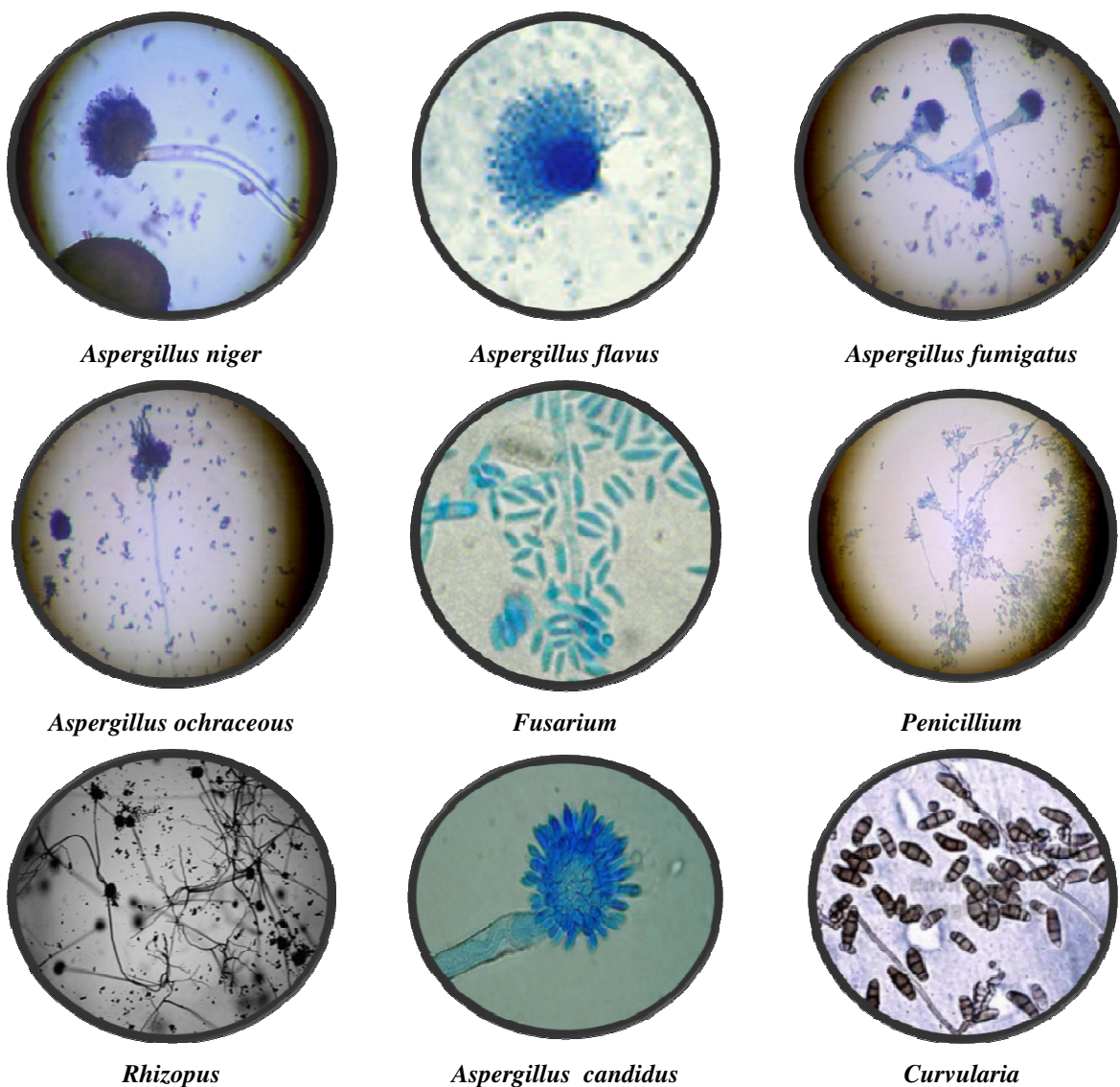
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**Table-1**  
 Optimum temperature and moisture content

Name of fungi	Temperature Range	Moisture Range
<i>A. candidus</i>	37° C	80-85%
<i>A. flavus</i>	30-35° C	75-85%
<i>A. fumigatus</i>	40° C	75-85%
<i>A. niger</i>	25-35° C	82-90%
<i>A. ochraceus</i>	25-30° C	89-94%
<i>Fusarium sp.</i>	23-28° C	90-94%
<i>Penicillium sp.</i>	30° C	86%
<i>Rhizopus</i>	25-35° C	95-97%
<i>Curvularia sp.</i>	35-40° C	75-80%





**Figure-14**  
**On microscopic view following fungi were isolated from charoli and almond**

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