Medicinal seeds, like those of agricultural and horticultural crops, carry a wide species of fungi either inside the seed coat, or between the seed coat and embryo, or as external contaminants. Seeds may be attacked by the pathogen while still borne on the tree in the field, during storage and subsequent handling, prior to sowing. Seed mycoflora during storage is governed by the moisture content of the seed and storage conditions such as temperature and humidity etc.

Seed borne infections are known to behave differently, depending on the nature or the pathogen and on sowing and growing conditions in the field. In severely infected seeds, the fungi attack the embryo and such seeds fail to germinate leading to loss of large quantity of seeds. On the other hand, the slightly infected seeds germinate, later only to serve as infection centers, from which the disease spread in the field, causing significant loss. A substantial work has been done in agricultural and horticultural crop on the role of seed-borne fungi in deteriorating seed quality and causing diseases, both in storage and in the field (Doyer, 1938; Christensen and Kaufmann, 1965; Neergaard, 1977).

Field fungi invade seeds either during development or after maturity. Fungi carried on seeds as spores, spore bearing structures like sclerotia, acervule, pycnidia and mycelium outside or inside the seeds. Some pathogens are seed borne but they cannot immediately transmit the disease to seedling. The pathogen may be just on the surface of the seed, then such seeds are said to be infested. In case of medicinal seeds, the active principles and medicinal
values of the seeds may be reduced or lost. The buyers may reject or purchase them at lower rates. In other cases the pathogen may lie within the seed tissues, then such seeds are said to be infected. How much of the seed-borne infection is needed to cause appreciable damage, varies with the kind of crop and the pathogen involved.

The direct impact of fungi on seed is considerable. The following types of diseases and disorders are encountered (Neergaard, 1977).

**Seed abortion**

The most prominent example of fungi causing seed abortion is the smut fungi. The floral organs of the host are replaced by the fructification of the parasite.

**Shrunken seeds, reduced seed size**

More or less heavy reduction of seed size and poorly developed shriveled seeds are the examples.

**Seed discoloration**

Discoloration of seeds is a very important degrading factor. In seeds for sowing, such disorder may indicate the presence of seed transmitted parasites. These seeds are of poor quality. There are three categories of seed discoloration; (1) Superficial necrotic lesions, (2) Fungous coating and (3) Pigmentation.
Many seed borne parasitic fungi infect the seed coat causing conspicuous necrotic black, brown to grey discoloration; examples are *Fusarium equiseti*, *F. semitectum* and *Macrophomina phaseolina*.

The second category of seed discoloration is coating by mycelium and sporulating structures of fungi. In cereal, this kind of contamination is frequent. The disorder is caused by profuse growth of pathogen such as *Drechslera* in different cereals as well as common saprophytes such *Alternaria tenuis* and *Cladosporium*, to a less extent by *Curvularia* spp.

**Reduction in germination capacity**

More deeply penetrating fungi in seed, reduce the viability of seeds, their longevity in storage, and their emergence in field. Due to toxin production by the fungus, stunted seedling are produced (Wallace, 1959).

Several fungi *viz.*, *Aspergillus flavus*, *Curvularia lunata* and *Fusarium moniliforme* were found to invade the outer seed coat, endosperm and embryo of rice seeds; and some of them produce non specific toxin, which kill the embryo resulting in germination failure (Suryanarayana, 1978). Seedling emerging from the infected seeds, get often blighted.

The seed mycoflora of 8 medicinal plant species from the forests of Aurangabad district and 1 from Gujrat state were studied and the results are presented in this chapter.
The mycoflora of the collected medicinal seeds, was isolated by standard Blotter method and Agar plate method, as recommended by ISTA (1966) and Neergaard, (1973).

1) **Blotter method**

The seeds of 9 medicinal plants from forest of Aurangabad district and Gujrat state were selected, as described earlier. The collected seeds were divided in lots of 100 seeds each. The seed mycoflora of these samples was studied by blotter paper method and the results obtained after 7 days of incubation are presented in table-5.1 and plate 5.1.

In all, 8 fungi were recorded from the seed samples of 9 medicinal plant species by blotter method (Table-5.1). This clearly indicates that there was a poor incidence of seed mycoflora. *Aspergillus flavus* and *Rhizopus oryzae* are the only fungi which were detected in all the seed samples. Another species of *A. niger*, also appeared on the seeds of all the medicinal plants, except that of *Plantago ovata*. *Cladosporium cladosporioides* also appeared on the seeds of all the medicinal plants, except that of *Holarrhena pubescences*. *A. kanagawaensis* was detected only on three medicinal seeds. Other fungi recorded on the medicinal seeds include *A. fumigatus*, *Fusarium oxysporum*, and *Penicillium corylophilum*. All the 8 fungi recorded appeared only on the seeds of 2 medicinal plant species *viz.*, *Butea monosperma* and *Pongamia pinnata*; and 7 fungi appeared on the seeds of *Madhuca longifolia* and *Semecarpus anacardium*. Minimum number of fungi appeared on the seeds of
H. pubescence, followed by the seeds of P. ovata, Tectona grandis and Thespesia populnea.

2) Agar plate method

Another method used for the isolation of seed mycoflora is agar plate method. Several workers (Sahu and Agrawal, 2001, Ghyare, 2002) have observed the agar plate method as the most successful method for detection of seed borne fungi. Therefore, the seed samples of 9 medicinal plant species were tested for isolation of seed mycoflora by agar plate method using PDA medium. Observations were recorded after 7 days of incubation. The results are presented in table-5.2 and plate- 5.2.

In all 32 fungi were recorded from the seed samples of 9 medicinal plants species by agar plate method (Table no.5.2). The seeds of Butea monosperma and Tectona grandis showed higher number of fungi (14), followed by Pongamia pinnata (9), Thespesia populnea, Madhuca longifolia and Plantago ovata (8); 7 fungi each in Azadirachta indica and Holarrhena pubescence. Minimum number of fungi (6) was recorded on the seeds of Semecarpus anacardium. Aspergillus niger and Rhizopus oryzae were recorded on all the 9 plant seeds, while Aspergillus flavus was recorded on all the plants except A. indica. Fusarium oxysporium was detected on the seeds of 6 plants species while A. fumigates, A. terreus and A. carbonarius were recorded on the seeds of 5 plants species. Aspergillus kanagawaensis, Cladosporium cladosporioides, Trichoderma aureoviridae, Penicillium corylophylum, were detected on the seed of 3 plants species. Pythium echinulatum was observed on
the seeds of 2 plants species, while all remaining fungi were observed on the seeds of only one medicinal plant. With the addition of 24 new fungi, over the blotter method, in all 32 fungi were detected on the seed sample by agar plate method. Therefore, agar plate method was used for the study of seed mycoflora in further experiments. In order to find out which agar medium supports the isolation of maximum number of fungi, experiment was carried out. (Tables: 5.3-5.13).

Description of the 32 fungi, observed on the medicinal seeds, is given below:

Division : Eumycota
Subdivision: Mastigomycotina
Class : Oomycetes
Order : Peronosporales
Family : Pythiaceae
Genus : Pythium

1) Pythium echinulatum Matthews (Plate 5.3, Fig.a1, 2, 3, 4, 5)

Watanabe (2002), pp 69

Sporangia mainly sub-globose or cylindrical, terminal or intercalary. Zoospores rarely discharged unnoticeably. Oogonia echinulate with acute protuberances regularly distributed, terminal, bearing single antheridia per oogonium. Oospores aplerotic, hypogynous, often unstalked, monoclinoius.

Dimensions: Sporangia 20-27 x 22.5-37.5 μm. Oogonia 20-30 μm in dia; protuberances 3.7-5 x 2.2-3.7 μm, Oospores 17.5-22.5 μm in dia.
Colonies on PDA white, mycelium cottony, branched, reverse cream colored.

2) **Pythium cf. indigoferae** Butler (Plate 5.3, Fig.b1, 2, 3, 4, 5)

Watanabe (2002), pp 72

Hyphae often showing dendroid branching, sometimes slightly swollen, often directly connected with sexual organs. No zoospores discharged. Oogonia terminal, borne on thick oogoniumphores, with single or occasionally double, mostly monoclinous or rarely hypogynous antheridia. Oospores aplerotic, occasionally developed parthenogenetically.

**Dimensions:** Hyphae mostly 7.5 μm thick; Oogonia 17.5-20 μm; oogoniumphores mostly 5 μm wide. Oospores 12.5-15 μm in dia, oospore wall 1.5-2 μm thick.

Colonies on PDA white colored, mycelium loosely arranged, branched, reverse cream colored.

3) **Pythium intermedium** deBary (Plate 5.3, Fig.c1, 2, 3, 4, 5)

Gilman (1967), pp 160-161

Hyphae very numerous, up to 6 μm thick, regular, without intercalary swellings. Branching often at right angles, sometimes dichotomous, more usually lateral. The tips of all free branches usually end in spores. These measure 18-20 μm in diameter, and are normally arranged in chains, when ripe they fall off readily, and can germinate immediately in fresh water. The lateral
spore may be short stalked, or sometimes develop from a swollen part which is immediately under the spore. In this case the lateral spore lies sessile. The chains are formed basipetally, the end spore being the oldest. The conidia are often provided with thick walls, showing a distinct double contour.

**Dimensions:** Conidia 15-20µm in diameter.

Colonies fast growing on PDA mostly colorless, mycelium aseptate, abundant, branched; reverse cream colored.

**4) Pythium salpingophorum**  Drechsler (Plate 5.4, Fig.a1, 2, 3, 4, 5)

Watanabe (2002), pp 83

Hyphal swellings globose, not proliferated. Oogonia usually intercalary, smooth-walled, usually formed in a series, bearing aplerotic oospores. Aplerotic oospores often formed parthenogenetically.

**Dimensions:** Oogonia 20-26 µm, oospoers 15-20 µm.

Colonies on PDA white colored, hyphae loosely arranged, branched, reverse cream colored.

**Subdivision:** Zygomycotina

**Class** : Zygomycetes

**Order** : Mucorales

**Family** : Choanephoraceae

**Genus** : Cunninghamella
5) **Cunningliamella echinulata** (Thaxter)Thaxter

(Plate 5.4, Fig.b1, 2, 3, 4, 5)

Watanabe (2002), pp 96

Sporangiophores erect, simple or branched with verticilliate or sympodial branches in a few positions, terminated in vesicles with sterigmata and spores (sporangiospores). Vesicles hyaline, pale brown, globose or subglobose. Spores yellowish globose, 1-celled, echinulate conspicuously.

**Dimensions:** Sporangiophores over 800 µm tall; branches 10-91 x 5 µm; vesicles on sporangiophores 25-37.5 x 20-35 µm; vesicles on branches 13-23 x 11-20 µm.

Colony on PDA white, turning yellow with are floccose, reverse yellow.

**Family: Mucoraceae**

6) **Rhizopus oryzae** Went & Prnisen Geerligs (Plate 5.4, Fig.c1, 2, 3, 4)

Watanabe (2002), pp 125

Sporangiophores erect, branched, yellowish to dark brown, rhizoids connected directly to sporangiophores bearing sporangia terminally. Sporangia globose, dark brown, minutely spiny, apparently subglobose after maturity, columellate on dehiscence: collumellae globose, brown. Sporangiospores subglobose to subellipsoidal, pale brown with stripes.
**Dimensions:** Sporangiophores 1.5-2.5 mm tall; 22.5-25 mm μm wide basally; sporangia 107.2-180 μm in diameter; columellae 77-125 x 90-115 μm sporangial spores 7.7-11.3 x 5.7-7.5 μm.

Colonies on PDA blackish, cottony mycelium, hyphae loosely arranged.

**Family: Cephalidaceae**

7) *Syncephalis cornu* Van Tieghem and Le Monnier

(Plate 5.5, Fig.a1,2,3,4,5, 6)

Gilman (1967), pp 68

Vegetative hyphae inconspicuous in the substrata sporophores (conidiophores) usually unbranched, attached at the base by a few rhizoid like hyphae. At their tips the sporophore enlarge into a vesicle. Sporophores strongly recurved above, tapering both above and below. Heads colorless or light yellow, with numerous spindle shaped basal cells, each of which bears a part-sporangium with 4-6 spores. Spores elliptic or spindle-shaped with a thick smooth wall.

**Dimensions:** Sporophores about 180 μm high, Heads usually 30 μm in diameter, Spores 4-6 x 10-12 μm.

Colony on PDA white cottony, mycelium branched reverse green.
Subdivision: Ascomycotina
Class: Parenmycetes
Order: Sphaerials
Family: Chaetomiaceae

8) Chaetomium brasiliense Batista & Pontual (Plate 5.5, Fig.b1, 2, 3, 4, 5)

Watanabe (2002), pp 140

Perithecia ovate, covered with terminal hairs on the upper surface; terminal hairs pale brown, curled spirally and curved, rough on the surface. Asci cylindrical 8-ascosporous in one row. Ascospores dark green, ellipsoidal, apiculate at one end.

Dimensions: Perithecia 100 x 80 µm: terminal hairs 5.5 µm wide. Asci 47.5-48.8 x 6.2-7.5 µm. Ascospores 6.2-7.8 x 5.2-6.5 µm.

Colonies on PDA compact, brownish in color; reverse dark colored.

9) Chaetomium cochliodes Palliser (Plate 5.5, Fig.c1, 2, 3, 4, 5)

Watanabe (2002), pp 141

Perithecium, subglobose covered with terminal hairs on the upper surface, rhizoidal basally: terminal hairs dark yellowish green, straight, wavy, curved, loosely curled spirally often 4 times or undulate. Asci hyalin, clavate, 8-ascosporous. Ascospores brown, lemon-shaped, apiculate at both ends.
**Dimensions:** Perithecia 180-280 x 190-225 µm. Asci 72.5-110 x 8-20 µm.

Ascospores 7.5-10 x 6-8 µm.

Colonies on PDA compact, dull green in color, reverse black.

10) *Chaetomium globosum*  Kunze:Fries (Plate 5.6, Fig.a1, 2, 3, 4)

Watanabe (2002), pp 146

Perithecia brown, subglobose, ellipsoidal and almost covered with terminal hairs on the upper surface, rhizoidal basally: terminal hairs brown, rough on the surface, undulate, curved. Asci hyalin, clavate, 8-ascosporous. Ascospores olive-colored, lemon-shaped, apiculate at both ends.

**Dimensions:** Perithecia 150-211 x 130-175 µm; Asci 45-75 x 12.5-13 µm.

Ascospores 9-10.5 x 6.5-8.8 µm.

Colonies on PDA in fresh conditions olivaceous, but in dry specimen dark brown and membranous, thickly and evenly clothed with slender flexous hairs.

**Order** : Hypocreales  
**Family** : Nectriaceae

11) *Neocosmospora africana* v.Arx. (Plate 5.6, Fig.b1, 2, 3, 4, 5, 6, 7)

Gilman (1967), pp 190-191.

Perithecia gregarious, often closely crowded, bright red, smooth with a very prominent, obtuse ostiole, becoming perforate. Peridium of large cells,
Perithecia flask-shaped, Asci nearly cylindrical, Ascospores uniseriate, subglobose; at first hyaline, becoming brown with outer surface becoming rough and wrinkled, 10 µm in diameter.

**Dimensions:** Peridium 12-15 µm in dia., Perithecia 200-225 x 250-275 µm, Asci eight-spored, 80-90 x 12-15 µm.

Colonies on PDA white, mycelium spreading, creeping with dark, compact structures.

**Division** : Ascomycota*

**Subdivision** : Pezizomycotina

**Class** : Dothideomycetes

**Order** : Incertaesedis

**Family** : Incertaesedis

12) *Hiospira* state of *Brooksia tropicalis* Hansf. (Plate 5.6, Fig.c1, 2, 3, 4)


Hyphae septate, fluorescent yellow, Conidiophores thick except near the base where they are narrower. Conidia much coiled.

**Dimensions:** Conidiophores up to 3 mm long, 6.5-10 µm thick except near the base where they are narrower. Conidia upto 90 x 40 µm, filaments 7-10 µm thick.

Colonies on PDA fluorescent yellow. Dense mucoid on Madhuca seed.
The specimen is described as per the information on:

en.wikipedia.org/wiki/Brooksia

**Division**: Eumycota  
**Subdivision**: Deuteromycotina  
**Class**: Hyphomycetes  
**Order**: Moniliales  
**Family**: Moniliaceae

13) *Aspergillus carbonarius* (Plate 5.7, Fig.a1, 2, 3)

genome.jgi-psf.org/Aspca3.

Conidiophores pale brown, thick walled, inflated at the apex, forming globose vesicle, bearing conidial heads. Conidia phialosporous, brown, black in mass, globose.

**Dimensions**: Conidiophores over 740 µm x 11-15 µm, conidia 4.0-4.8 µm in dia.

Colonies on PDA fast growing, brownish black.

*A. carbonarius* resembles *A. niger* in many features, and indeed the two species are very closely related. *A. carbonarius* differs from *A. niger* most notably in the production of larger spores, although other minor morphological differences exist.
14) *Aspergillus flavus*  Link (Plate 5.7, Fig.b1, 2, 3)

Gilman (1967), pp 225

Conidiophores arise separately from the substratum, granular, gradually enlarging upward to from a vesicle. Heads in every colony vary from small with a few chains of conidia to large columnar masses or both mixed in the same area; small heads with small dome-like vesicles and single series of a few phialides. Large heads partly with simple phialides, partly with branched or double series, or with both in the same head.

**Dimensions:** Conidiophores 400-700 µm long x 5-15 µm in dia., vesicle 10-30 µm to 40 µm in dia, Primary phialides, 7-10 x 3-4 µ; secondary 7-10 x 2.5-3.5 µm. Conidia globose 2 x 3 – 5x 6 µm.

Colonies on PDA widely spreading, greenish velvety.

15) *A. fumigatus*  Fresen. (Plate 5.7, Fig.c1, 2, 3)

Nagamani *et al*., (2006), pp 138

Conidiophores short, smooth, light green, septate, gradually enlarging into a flask shaped vesicle; vesicles fertile on the upper half, bearing a single series of phialides; phialides closely packed, conidia globose to sub-globose, green in mass, echinulate, Sclerotia and cleistothecia absent.
**Dimensions:** Conidiophores up to 300 µm in length and 5-8 µm in breadth, vesicles 20-30 µm in dia, Phialides, 6-8 x 2-3 µm; Conidia 2.5-3 µm

Colonies on PDA spreading, dull blue-green, velvety. To floccose; white at first, reverse colorless to varying in shades; conidial heads columnar, compact, often densely crowded up to 400 x 50 µm.

16) *A. kanagawaensis* Nehira. (Plate 5.8, Fig.a1, 2, 3,4)

Nagamani *et al.*, (2006), pp 140

Conidiophores usually erect (large heads) but sometimes even nodding small heads. Variable in length, with smooth walls, about 1 µm thick to 1.5 µm at the base, yellow to brown with pigmentation most conspicuous near the vesicle; vesicles often slightly flattened and orange-brown at the base; phialides uniseriate, crowded, covering upper ¾ of the vesicle, 5-7.5 x 2-3 µm; conidia globose, lightly colored and smooth.

**Dimensions:** Conidiophores most commonly 200-500 µm x 3.5-7 µm, Vesicles mostly 15-20 µm but ranging from 8-25 µm in diameter, Conidia commonly 50-100 µm.

Colonies on MEA and PDA growing rapidly, 6-7 cm in 2 weeks, velvety from abundant conidial heads that arise from the mycelium at the agar surface in cinnamon shade; reverse dull orange to olive; exudates lacking; odour strong; conidial heads loosely radiate with divergent chains of conidia.
17) *A. nidulans* (Eidam) Winter (Plate 5.8, Fig.b1, 2, 3,4)

Gilman (1967), pp 220-221

Cleistothecia developed separately within or upon the layer, globose, with outer layer a yellowish to cinnamon colored envelope of scattered hyphae bearing hulle cells wall a single layer of cells, dark reddish-purple in ripening becoming a mass of eight-spored asci which break down leaving the ascospore free. Ascospores purpled-red, lenticular, smooth-walled.

**Dimensions:** Cleistothecia 100-125 µm in diameter, hulle cells up to 25 µm in dia.

Colonies on PDA, spreading broadly, dark cress-green from abundant conidial heads during the first two weeks; cleistothecia developing from the center of the colony outward, separately produced, often abundant. Reverse of colony in shades of purplish-red, becoming dark in age.

18) *A. niger* van Tieghem (Plate 5.8, Fig.c1, 2, 3,4)

Gilman (1967), pp 228,

Conidiophores mostly arise directly from the substratum, smooth, septate or nonseptate, varying greatly in length and diameter. Conidial heads fuscous, blackish-brown varying from small, almost columnar masses of a few conidial chains to the more common globose, Phialides typically in two series, thickly covering the vesicles, primary varying greatly in length, secondary 6-10
x 2-3 µm. conidia globose, at first smooth, but later spinulose with coloring substance.

**Dimensions:** Conidiophores 200-400 x 7-10 µm, Conidial chains up to 300-500 µm long; vesicles globose, commonly 20-50 µm, up to 100 µm in dia. Conidia mostly 2.5-4 µm.

Colonies on PDA medium rapidly growing, black, aerial hyphae usually scantily produced.

19) *A. parasiticus* Speare (Plate 5.9, Fig.a1, 2, 3,4,5 )

Watanabe (2002), pp 194

Conidiophores erect, simple, rough in the surface with foot cells basally, inflated at the apex forming globose vesicles, bearing radiate conidial head composed of catenulate conidia, borne on uniseriate phialiades; conidial heads yellowish green, radiate, columnar. Conidia phialosporous, pale green, globose, echinulate.

**Dimensions:** Conidiophores over 400 µm tall x 10.5-13.5 µm, vesicles 24-40 µm in diameter phialides: 6.2-16.3 x 3.5-4.3 µm. Conidial heads 160-250 µm in diameter. Conidia 3.7-5.5 µm in dia.

Colonies on PDA medium dark yellow green and velvety.

20) *A. terreus* Thom (Plate 5.9, Fig.b1, 2, 3,4 )

Gilman (1967), pp 225-226
Conidiophores more or less with smooth walls. Vesicle, bearing phialides usually in two series upon its dome-like upper surface. Phialides are closely packed. Heads becoming solid columnar masses up to 500 µm long x 50 µm in dia. Conidia smooth, in long parallel adherent chains. Cleistothecia not found.

**Dimensions:** Conidiophores up to 150 µm or even 250 µm long x 5-8 µm in dia, Vesicle commonly 12-18 µm, Conidia globose 2.2-2.5 µm or 3 µm dia.

Colonies on PDA form tints of pinkish-cinnamon through cinnamon to deeper brown shades in age, spreading velvety. Reverse agar pale or bright yellow to fairly deep browns.

**21) Cephaliophora irregularis**  Thaxter (Plate 5.9, Fig.c1, 2, 3, 4, 5,6 )

Nagamani *et al.*, (2006), pp 165

Conidiophores colorless or pale brown, smooth; conidiogenous cells spherical or subspherical sometime lobed, with a protuberant hilum, at first colorless, later pale to mid brown, often darker at the septa, basal cells frequently paler, smooth, 1-many septate.

**Dimensions:** Hyphae 2-9 µm wide; conidiophores clavate, upto 120 µm long, 6-10 µm wide near the base; Conidiogenous cells swollen, 20-60 x 15-35 µm; conidia varying in shape, pyriform or turbinate, sometimes lobed, colorless to pale brown, reddish brown in mass when mature, 1-2 septate, 20-44 long, 13-33 µm wide in the broadest part, basal cell paler.
Colonies on PDA effuse, pink, buff or reddish brown; mycelium immersed and superficial; stroma, setae and hyphopodia absent.

22) *Monilia implicata* Gilman and Abbott (Plate 5.10, Fig.a1, 2, 3)

Gilman (1967), pp 208

Conidiophores prostrate, arising laterally from aerial mycelium thickly crowded on the fertile hyphae, tapering gradually toward apex, hyalin. Conidial chains very long. Conidia lens-shaped, apiculate, hyalin.

**Dimensions:** Conidiophores 20-100 µm long. Conidia 3-4.3 x 1-1.5 µm.

Colonies on PDA spreading, cottony to floccose, consisting of interwoven, hyalin, aerial hyphae and masses of very long, interangled conidial chains; surface pure white, reverse colorless to cream.

23) *Penicillium corylophilum* Dierckx (Plate 5.10, Fig.b1, 2, 3)

Watanabe (2002), pp 352

Conidiophores hyalin, erect, branched penicilately at the apexes with 2-3 metula, verticillate phialides on each metual and rather aggregated, compact; conidial heads composed of catenulate conidia on each phialide; phialides tapering gradually with pointed tips. Conidia phialosporous, hyalin, 1-celled, minutely echinulate on the surface.

**Dimensions:** Conidiophores 120-220 µm long; phialides 10.5-12.5 x 2.5 µm, conidia 2.7-3.5 x 2.2-2.3 µm.
Colonies on PDA at fruit white to cream, turning green colored, becoming velvety, more or less zonate; reverse light brown to dark colored.

24) *Sporotrichum carnis* Brooks and Hansford (Plate 5.10, Fig.c1, 2, 3, 4)  
Gilman (1967), pp 295

Conidiophores not well differentiated, much branched, hyalin. Conidia formed laterally or terminally from slightly swollen distal cells of the conidiophore branches, brightly colored, oval-pyriform.

**Dimensions:** Hyphae 1-2 µm in dia. Conidia 2-5 x 2-4 µm.

Colonies on PDA dark reddish, closely appressed to the substrate; hyphae creeping, branched, hyalin.

25) *Trichoderma aureoviride* Rafai (Plate 5.11, Fig.a1, 2, 3, 4)  
Watanabe (2002), pp 432

Conidiophores branched, bearing spore mass on each of the phialides: phialides often verticillate, short and thick. Conidia phialosporous, hyaline, ovate, 1-celled. Chlamydospores pale brown, subglobose, granulate.

Sterile hyphae creeping, septate, forming a flat, firm turf. Conidiophores erect, arising from short, branched side branches, branching usually opposite, bearing terminally the conidial heads. Conidia small, mostly globose, bright colored. (Gilman, 1967).
**Dimensions:** Phialides 8.5-11 x 2.4-2.7 μm. Conidia 2.4-2.7 x 2.1-2.5 μm. Chlamydospores 5.2-7.5 μm in dia.

Colonies growing slowly on PDA, mycelium white initially turning dull green with the development of conidiophores. Mycelium forms compact network, hypahe branched, septate, colorless (Nagmani et al., 2006).

**Family: Dematiaceae**

**26) Alternaria (Trichoconis) padwickii** (Ganguly) M.B.Ellis

(Plate 5.11, Fig.b1, 2, 3 )

Rangaswami (1988), pp 174

The fungus is characterized by the formation of conidia borne on erect conidiophores. Conidia are elongately fusoid, with a long beak-like appendage at the tip, 3-5 septate, creamy yellow, thick walled, straight but constricted at the septa.

**Dimensions:** conidiophores 100-175 μm long and 3-6 μm wide. Conidia about 100-107 μm long and 8-19 μm wide.

Colonies on PDA small, yellowish and compact.

**27) Cladosporium cladosporioides** (Fresen.) de Vries (Plate 5.11, Fig.c1,2,3,4) Nagamani et al., (2006), pp 189

Conidiophores macronematous, light olivaceous brown, smooth without swellings and sympodial elongation, branching acropleuroseptate, slightly
verruculose, 9-33 x 3-4.5 \( \mu m \); conidia formed in long branched chains, aseptate, ellipsoidal to limoniform, olive to brown.

**Dimensions:** Conidiophores 100-224 x 2.5-3.8 \( \mu m \); branches 10-22.5 x 2.5-3 \( \mu m \). Conidia ovate 2.5 -4.9 x 2-3 \( \mu m \); Cylindrical 7.5-12.7 x 3.6-4.2 \( \mu m \) (Watanabe, 2002).

Colonies effuse mycelium submerged, velvety. Colonies reaching 3-5 cm diameter in 10 days on PDA, light olive green to olive green to brown, reverse olivaceous black.

28) *Cochliobolus hawaiiensis* Alcorn

(*Helminthosporium hawaiense*, Bugnic.) (Plate 5.12 a1, 2, 3)

Nagamani *et al.*, (2006), pp 195

Conidiophores simple, slightly geniculate, pale to mid-brown, septate, conidia straight, ellipsoidal, oblong or cylindrical, pale brown, smooth, 3-7 distoseptate.

**Dimensions:** Conidiophores 42-145 x 2-7 \( \mu m \), Conidia 12-37 x 5-11 \( \mu m \).

Colonies spreading rapidly on PDA, dark gray with abundant aerial mycelium.
Order : Tubercuariales
Family : Tuberculariaceae

29) *Fusarium oxysporum* (Schl.) emend. Snyder & Hansen

(Plate 5.12 b1,2,3)

Watanabe (2002), pp273

Conidiophores hyaline, simple, short or not well differentiated form hyphae, bearing spore masses at the apexes. Conidia phialosporous, hyaline of two kinds; macroconidia boat shaped, with slightly tapering apical cells and hooked basal cells, 4-celled; and microconidia ellipsoid, 1-celled. Chlamydospores brown, globose, usually solitary.

**Dimension** : Macroconidia 29.1-45 × 2.9-4.7 µm; microconidia 6-15.8 × 1.9-3.7 (-5) µm.

Colonies on PDA white with purple tinge, fast growing, floccose, reverse purple (Nagmani *et al.*, 2006).

30) *Fusarium solani* (Mart.) App. Et Wr.emend. Snyder & Hansen

(Plate 5.12 c1, 2, 3, 4)

Watanabe (2002), pp 275

Conidiophores hyalin, simple, bearing spore masses at the apexes, as tall as the length of macroconidia by a few times, conidia phialosprous, hyalin, of two kinds: macroconidia with slightly curved apical cells, 2 cylindrical central...
cells, often slightly curved in one side, and hooked foot cells, usually 3-5 celled; and microconidia cylindrical, 1 to 2 celled. Chlamydosproes brown, globose and usually solitary.

**Dimensions:** Conidiophores 50-165 x 2.4-4.3 µm. spores masses 10-25 µm in diameter. Conidia: macroconidia 31.5-59.4 x 4.6-6.2 µm; microconidia 7.2-15 x 2.4-3.9 µm. Chlamydospore 6-7.3 µm in dia.

Colonies on PDA fast growing, cream colored, become powdery with age, colony on reverse side appears evenly zonated and yellow.

**Order:** Agronomycetales

**Family:** Agronomycetaceae

31) *Rhizoctonia oryzae-sativae* (Sawada)Mordue (Plate 5.13 a1,2,3)

Watanabe (2002), pp390

Conidia not formed. Hyphae pale brown, branched angularly with side branches septated closely near the main hyphae and constricted basally. Monilioid cells usually formed. Sclerotia discrete or aggregated, pale brown to brown various in shape and size.

**Dimensions:** Hyphae 6-10 µm wide.
Class: Coelomycetes
Order: Sphaeriales
Family: Sphaeriales

32) *Oedocephalum nayoroense*  T. Watanabe (Plate 5.13 b1,2,3)

Watanabe (2002), pp 328-329

Conidiophores erect, simple or rarely branched, clavate, bearing 1-16 conidia at sterigmata borne on apical fertile portions, on which appear basidia and basidiospores. Conidia yellowish brown or brown, ellipsoidal. 1-celled. No clamp connection present on hyphae.

**Dimensions:** Conidiophores 92.5-195 x 12.5 -20 µm. Conidia 11.5-15 x 6-7.5 µm.

Colonies on PDA initially white, turning brown with age.

3) Effect of different agar media

The influence of different nutrients, on the occurrence of seed mycoflora of 9 medicinal plant species, was studied by using different agar media, *viz.*, CzA, GNA, MEA, PDA, RBA and SEA. The incidence of mycoflora developed on the seeds was recorded after 7 days of incubation and the results are presented in tables 5.3 to 5.11.

It is noted from table 5.3 that maximum number of fungi (7) was isolated from the seeds of *Azadirachta indica* on PDA medium. *A. niger* is the only fungus which was isolated from all the media except the medium CzA. On
CzA medium only *Rhizopus oryzae* was isolated. Other media showed variable results.

Seed mycoflora of *Butea monosperma* was observed to be maximum (13) on PDA medium (Table 5.4). From MEA, RBA and SEA media 4 fungi each were isolated; while on CzA and GNA only 3 fungi were isolated. *A. niger* and *A. flavus* were the only 2 fungi which have grown on all the media used. 50% fungi have grown on only one medium, while other fungi showed variable occurrence on different media.

On PDA medium highest number of fungi (7) was isolated from the seeds of *Holarrhena pubescence* (Table-5.5). 4 fungi each were isolated from GNA and SEA media, while only 2 fungi were isolated from CzA, MEA and RBA media. *A. flavus* and *A. niger* are the only two fungi which have grown on all the 6 media used, followed by *F. oxysporum* which has grown on 4 media. Interestingly *A. fumigatus* and *A. terreus* have grown only on PDA medium.

Isolation of seed mycoflora from *Madhuca longifolia* showed highest number of fungi (8) on PDA medium (Table 5.6), followed by the medium SEA on which 5 fungi have grown. Other media showed variable results. *A. niger* and *A. flavus*, were the fungi which have grown on all the media used, followed by *A. terreus* which has grown on 5 media. *Monilia implicata, Rhizopus oryzae, A. padwickii* are the 3 fungi which have grown on PDA medium only.

From table-5.7, it is revealed that PDA medium is the best for the isolation of maximum number of fungi (8); followed by SEA, on which 6 fungi
have grown. CzA and RBA media supported the growth of minimum number of fungi (2). *A. niger* is the only fungus which has grown on all the media. *P. echinulatum* has grown only on PDA medium. Other media showed variable results.

Isolation of seed mycoflora from *Pongamia pinnata* revealed that PDA medium is the best for this purpose, as maximum number of fungi (9) have grown on it (Table-5.8). This is followed by the media GNA and SEA, on which 5 fungi have grown on each of them. CzA and MEA media supported the growth of minimum number of fungi (2). *A. niger* is the only fungus which has grown on all the media; followed by *A. flavus*, which has grown on 5 media.

The data given in table-5.9 reveal that PDA is the best medium for the isolation of mycoflora from the seeds of *Semecarpus anacardium*, as 6 fungi have grown on it (Table-5.9). SEA medium supported the growth of 4 fungi, which is followed by GNA medium. MEA medium supported the growth of minimum number of fungi (1). *A. niger* is the only fungus which has grown on all the media. *Penicillium corylophilum* has grown only on PDA medium.

Data given in table-5.10 reveal that PDA in the most suitable medium for the isolation of seed mycoflora of *Tectona grandis*. However, only 3 or 4 fungi have grown on the other media used. *A. niger* is the only fungus which has grown on all the media, followed by *F. oxysporum*, which has been observed on 5 media.
The maximum mycoflora on the seeds of *Thespesia populnea* was observed on PDA medium (Table-5.11); followed by GNA and SEA media. MEA medium has supported the growth of only one fungus. Amongst the fungi grown, *A. niger* is the only fungus which has grown on all the media. *A terreus, P.indigoferae, P. intermedium* and *P. salpingophorum* are the fungi which have grown only on PDA medium.

It is observed from the experiments (table-5.3 to 5.11) that PDA was the best medium for isolation of seed mycoflora of 9 medicinal plants. The data in the tables also reveal that *Aspergillus niger* is the fungus, which is percent on the seeds of all the plants, followed by *A. flavus*. *A. niger* has grown on all the media used except CzA, on which it was not observed on the seeds of *Azadirachta indica*. Based on the results obtained, PDA medium was selected for the further studies.

**4) Effect of pH**

pH of the medium is another deciding physical factor for the growth and sporulation of mycoflora on seeds. Therefore, pH of PDA medium was adjusted to 7 different pH values viz., 2.5, 3.5, 4.5, 5.6, 6.5, 7.5, 8.5 with 0.1N HCL or 0.1N NaOH. Seeds of 9 medicinal plants were planted on these agar plates of different pH values, incubated for 7 days and the mycoflora was recorded. The results are presented in tables-5.12 to 5.20.

It is observed from the table-5.12 that pH 5.6 was best for the growth of seed mycoflora of *Azadirachta indica*. The percent incidence of all
the 7 fungi recorded was also maximum at this pH. The seed mycoflora could not be isolated at pH 2.5 and 8.5. Other treatments showed variable results.

The data presented in table-5.13 reveal that pH 5.6 was optimum for the isolation of seed mycoflora of *Butea monosperma*. The percent incidence of all the 13 fungi observed was also maximum at this pH. The pH treatment of 2.5, 3.5 and 8.5 were not favorable for the growth of seed mycoflora. At pH 7.5, *Aspergillus niger* was the only fungus which has grown on the medium. Other treatments showed variable results.

In case of *Holarrhena pubescens* it is observed that maximum incidence of seed borne fungi was at pH 5.6 (Table-5.14). The percent incidence of all the fungi was maximum at this pH. The pH treatment of 3.5 and 7.5 was not favorable for the growth of seed borne fungi, as only one fungus each has grown on it at this pH. Furthermore pH 2.5, and 8.5 were found to be inhibitory for the growth of fungi, as not a single fungus was observed at these pH values. pH treatments of 4.5 and 6.5 showed variable results.

It is observed from table 15 that pH 5.6 was most suitable for the growth of seed mycoflora of *Madhuca longifolia*. The percent incidence of all the 8 fungi, observed on the seeds, was also maximum at this pH. The pH treatment of 3.5 and 7.5 were not favorable for the growth of seed borne fungi, as only 2 and 3 fungi were recorded respectively on them at this pH. pH treatments at 4.5 and 6.5 showed occurrence of less number of fungi, compared to pH 5.6. It is further noted that the pH treatments of 2.5 and 8.5 were
inhibitory for the growth of seed mycoflora, as no fungus appeared at these treatments.

The studies on the effect of pH on percent incidence of seed borne fungi of *Plantago ovata* revealed that at pH 5.6 maximum occurrence of the fungi was recorded (Table-5.16). It is also observed that percent incidence of all the 8 fungi, isolated from the seed, was also maximum at this pH, followed by pH 4.5 and 6.5. Other pH treatments *viz.*, 2.5, 3.5, 7.5 and 8.5 were found to be totally inhibitory for the development of seed mycoflora.

The data presented in table-5.17 revealed that maximum occurrence of seed borne fungi of *Pongamia pinnata* was at pH 5.6. The maximum percent incidence, of the 9 fungi recorded, was also at this pH. The pH treatments at 3.5 and 7.5 were not favorable for the growth of fungi, as only 4 and 2 fungi were recorded respectively at these treatments. The treatment at pH 4.5 and 6.5 showed variable results. pH treatments of 2.5 and 8.5 were found to be totally inhibitory for the growth of fungi, as no fungus was recorded at these treatments. Interestingly it has been observed that *Brooksia tropicalis* has grown only at pH 5.6.

In case of *Semecarpus anacardium*, the occurrence of seed mycoflora was found maximum at pH 5.6 (Table-5.18), moreover at this pH, the percent incidence of the 6 fungi isolated was also maximum. The pH treatment at pH 4.5 and 6.5 showed variable results with respect to percent incidence. The pH treatments of 2.5, 3.5, 7.5 and 8.5 were totally inhibitory for the development of seed mycoflora.
The seed mycoflora of *Tectona grandis* was found to be maximum at pH 5.6 (Table-5.19). The pH treatment of 2.5, 3.5 and 8.5 were found totally not suitable for the isolation of seed mycoflora; while the other treatments *viz.*, pH 4.5, 6.5 and 7.5 showed variable results. At pH 4.5 and 6.5 only 8 fungi were observed in each treatment. Only 2 fungi were recorded at pH 7.5 in the percent experiment.

It is interesting to note that out of 14 fungi observed on the seeds, 5 fungi *viz.*, *Cephalophora irregularis, Chetomium cochlioides, C. globosum, Cunninghamamella, echinulata*, and *Syncephalis cornu* have developed on the seeds of *T. grandis* only at pH 5.6.

pH 5.6 was found to be most favorable for the isolation of seed mycoflora of *Thespesia populnea* (Table-5.20). The same pH showed maximum percent incidence of seed borne fungi. pH treatment of 2.5, 3.5, 7.5 and 8.5 were totally inhibitory for the development of seed mycoflora in percent investigation. Though the pH treatments of 4.5 and 6.5 supported the growth of fungi, the percent incidence in these treatments was low, compared with pH 5.6.

When effect of pH on the percent incidence of seed borne fungi of medicinal plants was investigated, it was observed that in all the seed samples, pH 5.6 was found to be supporting maximum number of fungi (5.12-5.20). It was further observed that pH treatment of 2.5 and 8.5 were inhibitory for the growth of seed mycoflora of the 9 medicinal plants studied. Other pH treatment showed variable results. It has also been noted that *Brooksia tropicalis* has
grown at pH 5.6 on the seeds of *Pongamia pinnata* only. Similarly *Cephalophora irregularis*, *Chaetomium cochlioides*, *C. globosum*, *Cunninghamella echinulata* and *Syncephalis cornu* have developed only at pH 5.6 on the seeds of *Tectona grandis*.

5) **Effect of incubation period:**

In order to understand the pattern of succession in some selected seed borne fungi, appearing on the seeds of 9 medicinal plants, the percent experiments were carried out. The seeds were kept on PDA medium and incubated for 8 days. An observation on the occurrence of seed mycoflora was recorded after 2, 4, 6, 7 and 8 days of incubation. The data collected is presented in the tables-5.21 to 5.29.

The data presented in table-5.21 reveal that more than 50% of fungi were percent from 6th days onwards of incubation, on the seeds of *Azadirachta indica*. However, maximum percent incidence was observed initially on 7th day, which remained constant on 8th day also. Two fungi *viz.*, *Aspergillus niger* and *Rhizopus oryzae* started their appearance 2 days after incubation. The percent incidence of these two fungi gradually increased and reached it maximum on 7th day. *A. carbonarius* appeared on the seeds 4 days letter and reached its maximum percentage incidence after 7 days. Remaining 4 fungi appeared on the seeds after 6th days and its maximum percent incidence was recorded after 7 days. Of the 7 fungi observed on the seeds, maximum percent incidence was of *A. niger* and *R. oryzae* (70%) while minimum percent
incidence was observed in case of *Neocosmospora africana* and *Sporotrichum carnis* (20%).

It is observed from table-22 that 3 fungi appeared on the seeds of *Butea monosperma* after 2 days incubation, while 5 fungi started their appearance each after 4 and 6 days of incubation. However, all the 13 fungi grown on the seeds reached their maximum percent incidence after 7 days of incubation only. The maximum percent incidence of seed borne fungi was found to be caused by *Rhizopus oryzae* (70%), while minimum (20%) was found to be caused by *Pythium echinulatum* and *Rhizoctonia oryzae-sative*. Remaining fungi occurred in the range of 30-60%.

Of the 7 fungi occurred on the seeds of *Holarrhena pubescens*, 3 developed after 2 days, and remaining 4 developed after 6 days of incubation (Table-5.23). The maximum incidence of fungi was observed after 7 days of incubation. Highest percent incidence of fungi was observed to be caused by *A. flavus* and *R. oryzae* (70%) and minimum (20%) by 3 fungi, viz., *A. fumigatus*, *A. kanagawaensis* and *A. terreus*. However, 40% incidence of *A. niger* and *F. oxysporum* was observed.

In case of *Madhuca longifolia* seeds, maximum incidence of fungi was observed on 7th day. In all, 8 fungi were observed (Table 5.24) and of them *Rhizopus oryzae* showed maximum incidence (70%), followed by *A. carbonarius* (60%). Minimum incidence has been observed in case of *Trichoderma oureoviridae* (20%). Of the 8 fungi observed, 2 developed after 2 days, 3 each developed after 4 days and 6th days.
It is observed from table-5.25 that maximum occurrence of fungi on seeds of *Plantago ovata* was observed after 7 days of incubation. 50% of the fungi have developed only after 6 days of incubation, while remaining 50% developed after 2 or 4 days of incubation. Maximum incidence (60%) observed was of *Rhizopus oryzae* while minimum (10%) of *A. fumigatus*; remaining 6 fungi showed variable incidence of occurrence.

The seed mycoflora of *Pongamia pinnata* started its appearance after 2 days of incubation and reached its maximum after 7 days (Table-5.26). The earliest observed fungi on *P. pinnata* seeds were *A. niger* and *R. oryzae*, while *Brooksia tropicalis* appeared only after 7 days of incubation. Maximum percentage of seed borne fungi was observed in case of *R. oryzae* (70%) and minimum in case of *B. tropicalis* (10%). Variation of incidence of fungi was observed between 30 to 60%.

The data presented in table-5.27 reveal that highest percent incidence of seed borne fungi of *Semecarpus anacardium* was observed after 7 days of incubation. *Aspergillus niger*, *Penicillium corylophilum*, *Rhizopus oryzae* and *Fusarium oxysporum*, were detected from 2nd day onwards of incubation, while *A. flavus* and *A. fumigatus* appeared only after 6 days. Highest percent (80%) of incidence was observed in case *R. oryzae* and lowest with *A. flavus* (40%).

Incubation period of 7 days was found most suitable for causing maximum incidence of fungi on the seeds of *Tectona grandis* (Table-5.28). Of the 14 fungi recorded, *Rhizopus oryzae* showed maximum incidence (80%),
while *A. niduluns* and *Syncephalis cornu* showed minimum incidence (30%) on the seeds. However, all the 14 fungi developed on the seeds of *T. grandis*, showed highest percent incidence after 7 days of incubation.

It is noted from table-5.29 that highest percent incidence of seed borne fungi of *Thespesia populnea* was observed after 7 days of incubation. 5 fungi developed after 2 days of incubation and one fungus developed after 4 and 2 fungi after 6 days of incubation of the seeds. Highest incidence of occurrence (80%) was exhibited by *A. flavus* and *R. oryzae*, followed by *A. niger*, *A. carbonarius* and *A. terreus* (70%). *Pythium salpingophorum* exhibited only 20% occurrence on the seeds, which was minimum in percent experiment.

It can be concluded from the data presented in table-5.21 to 5.29 that incubation period of 7 days is most suitable for maximum percent incidence of seed borne fungi of 9 medicinal plants investigated. The data also reveal that 2 fungi *viz.*, *A. niger* and *Rhizopus oryzae* start developing on the seeds of all the 9 medicinal plants after 2 days of incubation. It is also noted from the tables that the seed borne fungi, occurring on different seeds increased their incidence with increase in incubation period, except *A. fumigatus*, where its incidence has not increased on the seeds of *P. ovata*, irrespective of increase in incubation period.

**6) Effect of incubation temperature**

In order to study the effect of incubation temperature on the occurrence of mycoflora, the seeds of 9 medicinal plants were tested at
different incubation temperatures *viz.*, 10, 20, 25, 30 and 40°C. the results obtained are presented in table-5.30 to 5.38.

It observed from table-5.30 that 3 fungi appeared at incubation temperature at 10°C on the seeds of *Azadirachta indica* 7 fungi were recorded at temperatures 20, 25, 30 and 40°C. The percent incidence of seed borne fungi was found to be maximum at 25°C, followed by 30°C. At 20° and 40°C less occurrence of seed mycoflora was noted. Therefore, it can be inferred that temperature range of 25°C to 30°C is optimum for the development of seed mycoflora and maximum appearance of fungi was at 25°C. Maximum percent incidence of seed mycoflora was of *Aspergillus niger* and *Rhizopus oryzae*, while minimum was of *Sporotrichum carnis*.

It is noted from table-5.31 that only 5 fungi could grow at 10°C and 7 fungi at 40°C. It is observed from the table that temperature range of 25° to 30°C is suitable for the development of seed mycoflora of *Butea monosperma*. At 20°C comparatively less fungi appeared. Two species of *Aspergillus* - *A. niger* and *A. flavus* and *Rhizopus oryzae* caused maximum percent incidence of seed mycoflora. The maximum incidence of seed mycoflora was noted at 25°C.

The results presented in table-5.32 show that 3 and 4 fungi could grow at temperatures 10° and 40°C respectively. The initiation of growth of seed borne fungi on *Holarrhena pubescens* was observed at 10°C. However, maximum incidence of mycoflora was observed at incubation temperature of 25°C followed by 30°C. At 25°C, *Aspergillus niger* and *Rhizopus oryzae* showed maximum percent incidence (70%) of seed mycoflora; while minimum
incidence observed was of *A. kanagawaensis*, *A. fumigatus* and *A. terreus* (40%). The fungus *A. kanagawaensis*, *A. fumigatus* and *F. oxysporum* ceased to develop at 40°C.

When the seeds of *Madhuca longifolia* were incubated at 10°C, only *Aspergillus niger* developed (Table-5.33). The appearance of fungi then gradually increased to 5 at 20°C and at 25°C 8 fungi developed on the seeds. The incubation temperature of 40°C could support the growth of 5 fungi. Though the number of fungi developed on the seeds at 25°C and 30°C were the same, the percent incidence was more at 25°C. At this temperature maximum incidence observed was of *A. niger* and *R. oryzae* (60%). *Alternaria padwikii* showed minimum number (10%) of occurrence. It is also noted that *A. padwikii* developed from the seeds only at 25°C and 30°C.

Of the 8 fungi observed on the seeds of *Platango ovata* (Table-5.34), none of them occurred on the seeds when incubated at 10°C. At 20°C only 5 fungi developed, while at 40°C 4 fungi developed. Incubation temperature of 25°C and 30°C was found optimum for the incidence of seed mycoflora. However, maximum incidence was observed at incubation temperature of 25°C. Maximum incidence of seed borne fungi observed was of *Rhizopus oryzae* (60%), followed by *A. niger* (50%). It was interesting to observe that of the 4 fungi occurred at incubation temperature of 40°C, the fungus *A. terreus* showed maximum incidence (30%) compared to other fungi.

The maximum incidence of seed borne fungi of *Pongamia pinnata* was observed at incubation temperature 25°C followed by 30°C (Table-5.35).
In percent experiment the incubation temperature of 10°C and 40°C were found not favourable for the development of seed borne fungi, as only 3 fungi have grown at each temperature. Of the 9 fungi developed on the seeds, except *Brooksia tropicalis*, all fungi appeared at 20°C incubation temperature. Maximum incidence of seed borne fungi was observed at 25°C followed by 30°C.

The data presented in (Table-5.36) reveal that the incubation temperature of 10°C and 40°C are not favourable for the development of seed mycoflora of *Semecarpus anacardium*, as only 1 and 2 fungi have grown respectively at these temperatures. At 20°C incubation temperature, 5 fungi have appeared, while 6 fungi developed at 25°C and 30°C. It is noted that incubation temperature of 25°C is suitable for the maximum percent incidence of seed mycoflora, followed by 30°C. Occurrence of *Rhizopus oryzae* was found to be highest (60%) and lowest in case of *Penicillium corylophilum* (30%).

Incubation temperature of 25°C was found most suitable for the development of seed mycoflora of *Tectona grandis* (Table-5.37); as 14 fungi have grown at this temperature. This is followed by temperatures 30, 20 and 40°C as 13, 6, and 4 fungi respectively appeared on the seeds. 10°C was found to be unsuitable for the growth of the seed mycoflora. At 25°C incubation temperature *Rhizopus oryzae*, showed maximum percent incidence (60%), followed by that of *Aspergillus niger* (50%). Minimum incidence (10%) was recorded in case of *Syncephalus cornu* and *A. nidulans*. Moreover these two
fungi have developed only at 25°C. Variable incidence of other fungi was recorded at this temperature.

The observations recorded with the occurrence of seed mycoflora of *Thespesia populnea* at different incubation temperatures, reveal that 25°C in most suitable for the development of fungi (Table-5.38). Of the 8 fungi observed, *A. niger* and *R. oryzae* shoved maximum incidence (70%), and minimum by *Pythium intermedium* and *P. salpingophorum* (20%). No fungus developed at 10°C, while 1 fungus has occurred at 40°C. At 20°C, 5 fungi developed; while at 30°C, 8 fungi were recorded. The incidence of *Rhizopus oryzae* was similar at 25°C and 30°C incubation temperatures.

It is inferred from the data presented in tables 5.30 to 5.38, that incubation temperature of 25°C supported the isolation of maximum number of fungi on solid media, from the medicinal seeds studied (5.30 to 5.38).