INTRODUCTION AND REVIEW OF LITERATURE
Chapter 1

**Introduction and Review of Literature**


in eight cultivars of India.


There are report about the Pythium rot Butler (1907), reported the disease first time, identified causal organism as Pythium gracile (Debar) schenck, P - butleri subramanian (1919), P-aphani - dermatum (Edson) Fitz (Mitra and subramanian 1928), P-bulleri subrum Thomas (1938), P - concepters Braun Park (1934), P- graminicolum subram Park (1935), P-myriotypium Drechsler (Uppal 1940), Park 1941, Bertus 1942, P-vexans debary Rama- krishna (1949), P-delienese Meurs Haware and Joshi (1974 a) P-pleroticum (Dohroo 1979), P-Zingiberum - Ichitani and shinsu (1980), P-ultinum Dohroo (1987).

Mehrotra (1952), Haware and Joshi (1973), during their studies on rhizome rot of ginger found Fusarium - roseum.
sclerotium rolfsii as well as *Fusarium oxysporum schlecht* in the
diseased plants.

However the main symptoms observed during
present investigations are lower leaves of the plant turning yellowish
red on their margins gradually spreading over the entire leaf blade.
the infected plant show characteristic symptoms of wilt and rot as a
result of vascular plugging (Bilgrami & Dubey 1993) in the form
of white buffy coloured pathogenic mycelium on the rotted rhizomes.
The rotted plants ultimately dry up, such plants can be pulled out
from parent rhizomes, close microscopic examination of diseased
tissue reveals creamy discoulouration of vascular elements. The causal
organism was identified as *Fusarium oxysporum f sp zingiberi*.

Earlier work carried out by Veitch (1943),
Simmond (1954,55,58) revealed the pathogen as *Fusarium
oxysporum schlecht*; however they could not identified the species
of the pathogen *Fusarium oxysporum schlecht*.

Subsequently Trujillo (1963), Teakle (1965)
Yang et al (1988), Sharma (1989), Chauhan and Patel (1990);


Viability of Fusarium oxysporum f.sp zingiberi

Studies on the viability of inoculum of the pathogens revealed that the fungal mycelium and chlamydospores remain in the active and potential stage in the soil for several years, capable of infecting the fresh crop of ginger (Zingiber officinale Rosc) from year to year. However during the present work, It was observed that mycelium and chlamydospores of Fusarium oxysporum f.sp zingiberi remained viable for four years (1997 to 2000). Earlier Armstrong and Armstrong (1981), Haware (1993), Dohroo (1995) had also been reported the survival of the pathogen for number of years in the soil.

Storage rot and Pathogens associated

During storage many fungi have been found associated with ginger rhizomes amongs them are Fusarium solani (Mart. )Sacc. and Fusarium moniliforme sheldon caused 48.6% rotting Rath et al (1978). Fusarium oxysporum schlechtened ex fr, Pythium deliense meurs and P-myriotylum have also been reported sharma & Jain (1977), Sharma (1989). Amongs pathogens associated on ginger rhizomes (storage) viz Aspergillus, Diplodia, Fusarium.

There are three different types of storage rot of ginger were studied, which were soft rot, caused by *pythium ultimum* (trow) showed rhizomes brown to blackish in flour. Secondly dry rot caused by *Fusarium oxysporum schlecht.* Whereas third one was Red rot caused by *verticillium chlamydosporium* (Goddard) Dohroo (2001).


**Control of Storage rot and Storage Modification**

Control of storage rot was carried out by
Carbendazim and Mancozeb Dohroo and Sharma (1986 b), Sharma et al (1992), Lodha et al (1994), Dohroo and Malhotra (1995), Ram et al (1999). Whereas Okwuowulu and Nnodu (1988) suggested Benomyl 750 ppm or Gibberellic acid 150 ppm or Imazalil or Prochloraz at 0.8 g per lit. (seed dip), and then storage at 10°C provide protection against infection.

If rhizomes stored in moist saw dust prolong storage against dehydration and infection (Okwuowulu and Nnodu (1988). Storage of rhizomes under cooled conditions may prolong storability for reducing weight loss and sprouting. During the present investigation an attempt has been made to modify the storage conditions by diping the rhizomes in Carbendazim and Mancozeb 0.1% w/v & then stored in sterilized yellow soil (Pootni mitti)and moist saw dust using the sterilized cold water at an intervals two weeks have prolonged the storability and reduced the sprouting and dehydration.

**Host Range specification**

Host range specifications of different fruits and vegetables with *Fusarium oxysporum f sp zingiberi* in terms of percentage rot were carried out. However the complete rotting were observed in *Momordica charantia, Cucumis sativus* and *Trichosanthes dioica* L after 11 days of incubation at 26,± 1°C and the results are

**Soil Cultural Filtrates Studies**

For determining the secondary cause of the problem, it is very important to conduct the studies of different soil cultural filtrates through Predip and Postdip studies during present studies. It is observed that there are number of soil borne pathogen including *Fusarium* species which have caused wilting and rotting in ginger rhizomes viz *Penicillium* species caused 95.00% of rotting. However *Nectria* species created 97.50% of rotting. Whereas *Ceratocystis* species caused 68.00% of rotting. However *pythium* species, *Gibbrella* species and *Fusarium* species have caused 82.50%, 77.50% and 70.00% rotting in the predip & postdip studies respectively.

**Efficacy of Water soluble extracts of some weeds found in and around ginger growing field on the percentage infection**

(11)
Through number of workers Singh et al (1955) Hoffman (1975); Dixit et al (1976); Reddy and Reddy (1987); Singh and Dwevedi (1990); Bansal and Gupta (2000); have analysed the antifungal properties of some plants against the disease incidence in many crops. No attempt was however made to evaluate the efficacy of water soluble extract of weeds on percentage infection of Fusarium oxysporum f sp zingiberi. an attempt has therefore, been made to evaluate the efficacy of some weeds in arresting the growth of the pathogen. The extract of Datura alba Nees proved to be most effective for arresting the growth and sporulation of the pathogen amounting to 70.75% of inhibition.

**Evaluation of some chemical compound to test their fusicidal effect on the pathogen**

Some work was carried out to test the efficacy of number of the chemicals compound for the control of Fusarium oxysporum f sp zingiberi Rosenberg (1962); Teakle (1965); Kothori (1966); Haware and joshi (1974); Dohroo and Sharma (1994); Ram et al (1999), Mohan et al (2001).
During present studies some experimental work has been carried out involving 8 chemicals compound namely Mancozeb M-45-75 WP, Dhanucop (copper oxychloride) 85 WP, Carbendazim 51 WP, Sulphur 80 WP, Carbendazim 51 WP + Mancozeb 75 WP, Thiram 50 WP, Bavistin 50 WP and Achook neem kernal based EC containing Azadirachtin 1300 ppm. to evaluate their fungicidal properties against *Fusarium oxysporum* f sp zingiberi. Carbendazim 51 WP + Mancozeb 75 WP in the ratio of 1:1 proved at 0.1% w/v to be most effective fungicides, at sowing followed by two subsquent tretments of the fungicides on 30th and 70th day after sowing the ginger crop has effectively checked the disease.

**Evaluation of water soluble fractions of soil amended with four oil-cakes against *Fusarium oxysporum* f sp zingiberi**

Though some work has been carried out to control the rhizome rot of ginger Ghorpade and Ajit (1982), Gupta (1985), Sadanandan and Iyer (1986), Thakore *et al* (1987) ,Sharma (1989), Dohroo (1993), Dohroo *et al* (1994) and Raj and Kapoor (1996). However rhizome rot of ginger has been spread to more areas, in view of this an attempt has been made to asses the effect of soil, amended with oil cakes.

During the present investigation the water soluble extracts of Castor (*Ricinus communis*) oil cake was proved
to be most effective and reduced 78.66% of disease incidence against *Fusarium oxysporum f sp zingiberi*. In spite of some work on control measures of *Fusarium* rot of ginger rhizomes, the disease is occurring year after year, causing serious damage to the crop in Bundelkhand region. Therefore, in the present investigation, an attempt has been made to find out some pathogenic aspects related to spread and perpetuation of rhizome rot of ginger in the areas of investigation, the following work has therefore been carried out during the present study.

1. Isolation and Identification of the pathogen causing rhizome rot of ginger.

2. A survey was carried out continuously for three years from 1997 to 1999 for determining the percentage disease incidence in different areas of Bundelkhand region.

3. Morphological studies of different isolates of *Fusarium oxysporum f sp zingiberi* have been carried out.

4. An extensive study on storage rot has been carried out.

5. Growth and sporulation studies of *Fusarium oxysporum f sp zingiberi* in (broth) and on synthetic semi solid media have been conducted.
6. Studies on most suitable temperatures for growth and sporulation have been carried out.

7. Studies on host range specifications involving different fruits and vegetables have been conducted.

8. Studies on development of rhizome rot of ginger seedlings through predip and postdip treatments involving different soil cultural filtrates have been conducted.

9. Efficacy of different oil-cakes against the pathogen have been tested.

10. Efficacy of different water soluble extracts of weeds & grasses have been tested against the pathogen.

11. Efficacy of different amino acids for control measures have been studied.

12. Eight fungicides have been tested against the pathogen, to find out the most suitable fungicide and its appropriate concentration to control the disease.

13. Histopathological studies have been done to find out mycelial stages responsible for causing rot in the host tissues.