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SURVIVAL OF FUNGI ON SEEDS OF BOTTLE GOURD, BITTER GOURD AND CUCUMBER

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Abstract

The survival of *Lasiodiplodia theobromae* in seeds of bottle gourd was correlated with the inoculum level of the fungus on seeds which survived up to 8 months. Survival of *M. phaseolina* on seeds of bottle gourd and cucumber varied and up to 50% survival was recorded after 5 and 6 months of storage. Recovery of field fungi viz., *Alternaria* spp., *Cladosporium* spp., and *Fusarium* spp., decreased after 3-6 months of storage whereas storage fungi viz., *Aspergillus flavus* and *A. niger* were most frequent after 6 till 24 months of storage.

Introduction

The longevity period of certain seed borne pathogens is dependent on the seeds they inhabit and on the capability of the pathogen to remain viable as well as virulent from one season to the next in or on seeds (Agrawal & Sinclair, 1997). The role of microorganisms in seed fate is poorly described, as are the seed bank factors influencing microbial growth, survival or seed associations (Chee- Sanford *et al.*, 2004). Pathogens may live longer than the seeds they colonized. *Bipolaris sorokiniana* may persist in barley seeds for 10 years or more (Mackacek & Wallace, 1952). *Macrophomina phaseolina* has found in infective state up to 20 months in seeds (Jitendra & Kumad, 2002). Storage fungi have greater in seed samples with higher moisture contents, even though most moisture contents were too low to permit mould growth (Sauer *et al.*, 1984) and have been found to reduce germinability of seeds of wheat and barley as compared to field fungi (Narkiewiez-Jodko, 1986). The study was carried out to examine the effect of seed storage at room temperature in germination and survival of the fungi on symptomatic and asymptomatic seeds of cucurbits.

Materials and Methods

Seeds of cucumber, bottle gourd and bitter gourd stored at room temperature were plated on three layered moistened blotters each month till there was no germination. Seeds of bottle gourd infected with *Lasiodiplodia theobromae* were categorized into heavily infected (100%), moderately infected (55%) and slightly infected (10%) seeds on the basis of dry examination and standard blotter methods. Each category of seeds was tested by the blotter method for the presence of the fungi and their germination after an interval of one month till the occurrence of fungus and seed germination stopped. Bottle gourd and cucumber seeds infected with *Macrophomina phaseolina* were examined by blotter method after one month interval till the occurrence of the fungus and seed germination stopped. As suggested by ISTA (Anon., 1976), 400 seeds of each sample were placed equidistantly over three well-soaked blotter papers in 9 cm diameter Petri dishes, 10 seeds per dish. The dishes were incubated at 24°C ± 1°C under 12 hours alternating cycles of artificial daylight supplied by cool white fluorescent tube (ADL) and darkness.

Results and Discussion

Seed germination of bottle gourd, cucumber and bitter gourd was significantly reduced as the storage period increased and was zero after 23, 19 and16 months respectively. Seed germination was not reduced up to 4, 6 and 9 month in bitter gourd, cucumber and bottle gourd respectively. Storage fungi viz., *Aspergillus flavus* and *A. niger* were significantly isolated after 5 months till the 24 months storage (Fig. 1). Recovery of field fungi viz., *Alternaria* spp., *Cladosporium* spp., and *Fusarium* spp., decreased significantly after 3-6 month of storage and were completely eliminated after 8 months (Fig. 2). *Rhizoctonia solani* was isolated from seeds of bitter gourd upto 7 month whereas *Myrothecium* spp., were isolated upto14 months (Fig. 3).

Seed germination is associated with storage time and seed health. In healthy seeds of bottle gourd, cucumber and bitter gourd, germination gradually decreased and totally declined after 23, 19, and 16 months of storage respectively. Similar reports have been made by Bankole (1994) that the percentage of seed germination of maize decreased with the storage time to the lowest after 12 month. Contrary to our results, there was increased in germination after 6^{th} and 11^{th} months of storage of *Botryodiplodia theobromae* in cotton in laboratory condition (Oliveira *et al.,* 1996). Maholay & Sohi (1982) have described increase in seed germination as the incidence declined from 5^{th} month indicating that infection had not penetrated deeply in seeds of squash and bottle gourd.

The predominant field fungi viz., *Alternaria* spp., *Cldosporium* spp., and *Fusarium* spp., on seeds of bottle gourd, cucumber and bitter gourd decreased significantly after 3-6 month of storage whereas recovery of storage fungi viz., *Aspergillus flavus* and *A. niger* were most frequent after 6^{th} till 24^{th} months of storage. Populations of *Alternaria alternata, Botryodiplodia theobromae, Fusarium* spp., and *Macrophomina phaseolina* have been reported to decrease with the time until they finally disappeared after 5^{th} months from seeds of maize whereas storage fungi viz., *Aspergillus flavus* and *Penicillium* spp., succeeded the field fungi (Bankole, 1994).

i. *Lasiodiplodia theobromae*: The heavily infected seeds showed survival of *L. theobromae* up to eight months. Occurrence of the fungus significantly declined after five and two months in moderately and slightly infected seeds respectively (Fig. 4). These results are in close conformity with the findings of Oliveira *et al*., (1996) that the occurrence of *L.theobromae* in seed samples of cotton declined greatly from the 4^{th} month of storage and zero from the 8^{th} month of storage. The fungus has been reported to survive for 12 months in seeds of bottle gourd (Maholay & Sohi, 1976). Seed germination significantly decreased as the storage period increased. In infected seeds, germination was significantly decreased after 4^{th}, 7^{th} and 14^{th} month storage in heavily, moderately and slightly infected seeds respectively. Similarly Maholay (1994) reported that healthy seeds remain viable longer than infected seeds.

The survival of *Lasiodiplodia theobromae* in seeds of bottle gourd was correlated with the inoculum level of the fungus on seeds. In highly infected seeds survival of the fungus was prolonged up to 8^{th} months. Similarly Colhoum & Muskett (1948) have reported that longevity was correlated with the severity of infection. The more heavily the seed was infected by *Ascochyta lini,* longer the fungus could survive in the seeds of flax. Contrary to this argument, Maholay & Sohi (1982) reported that variation in survival of the fungus in different infected lots may be due to severity of the infection on the seed as well as the extent of internal infection.

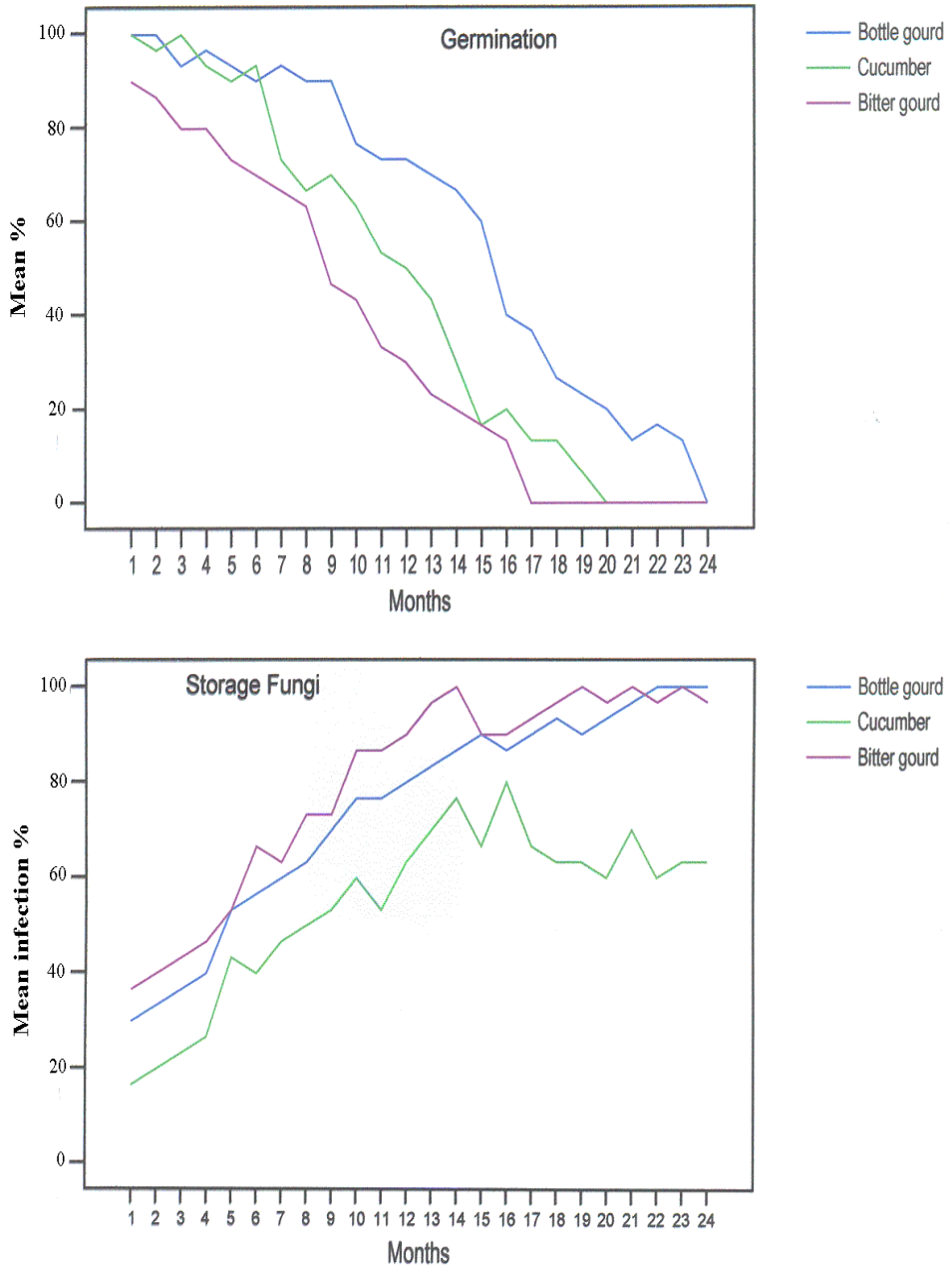

Fig. 1. Effect of storage period on germination and seed infection by storage fungi on bottle gourd, cucumber and bitter gourd.

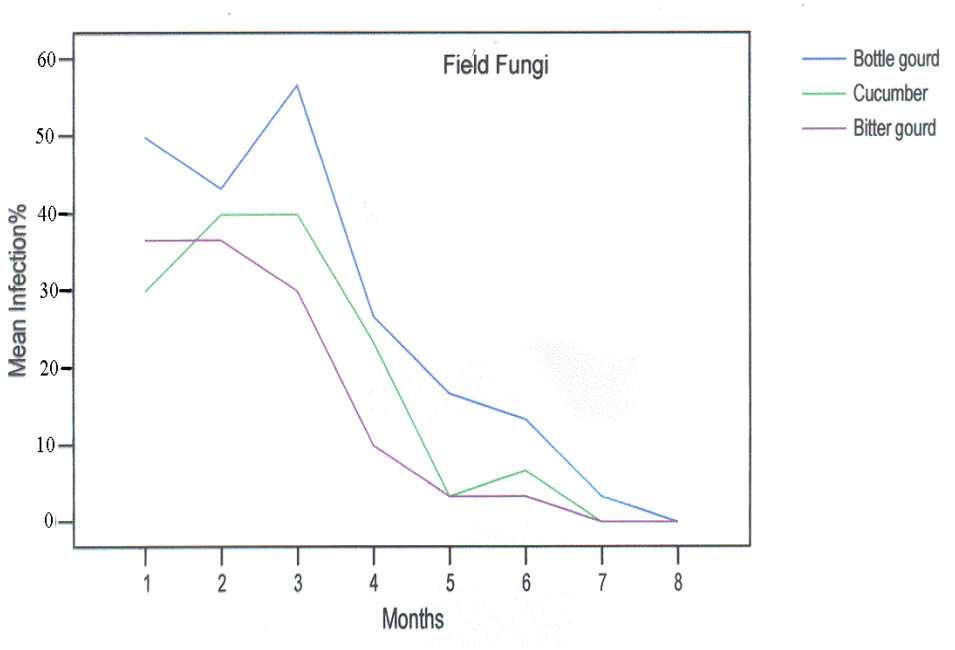

Fig. 2. Effect of storage period on seed infection of field fungi on bottle gourd, cucumber and bitter gourd.

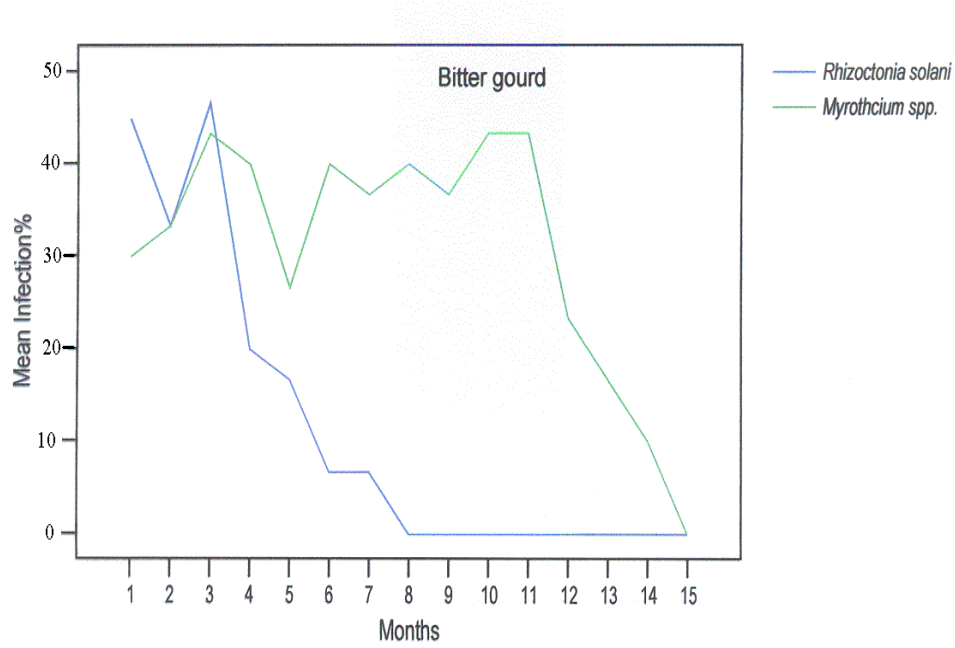

Fig. 3. Effect of storage period on seed infection by *Rhizoctonia solani* and *Myrothecium* spp., on bitter gourd.

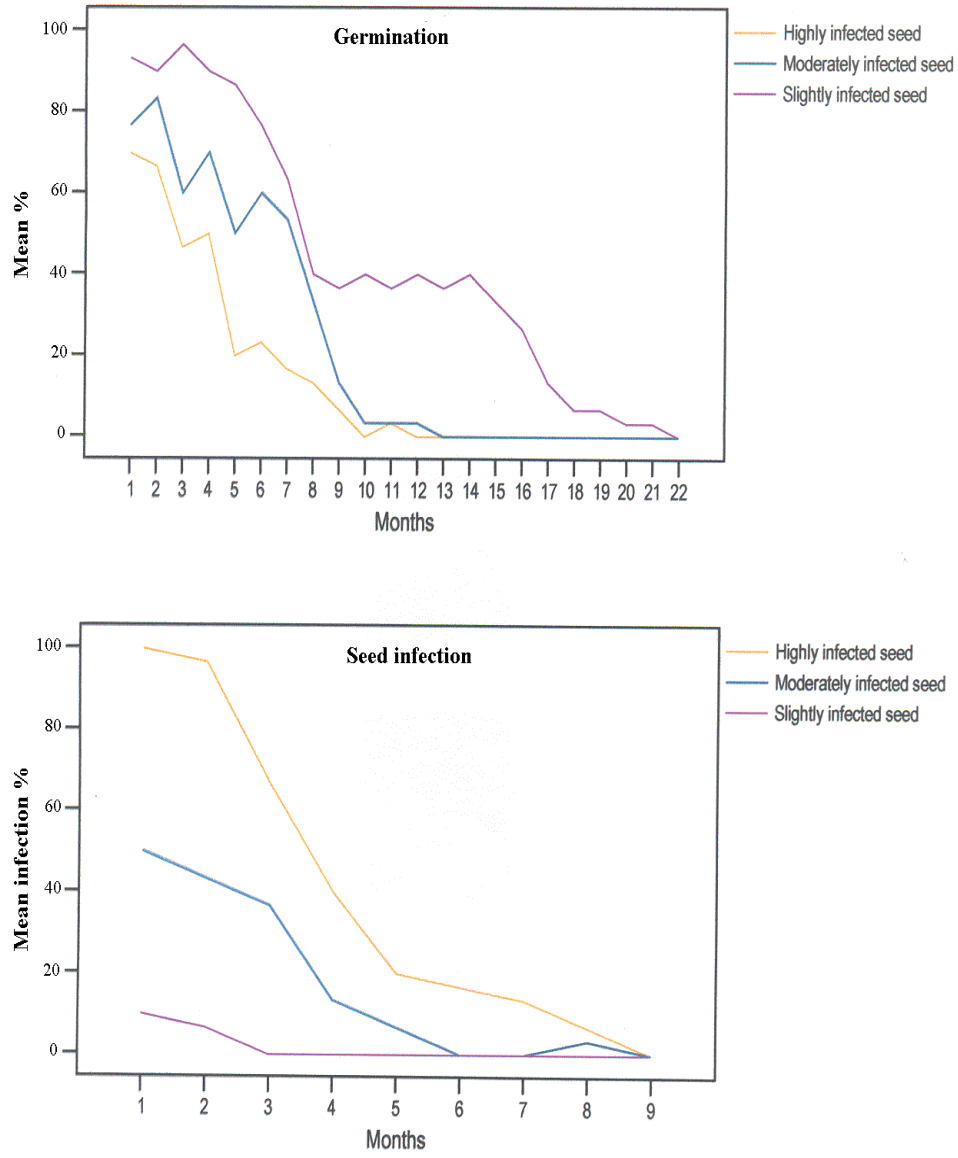

Fig. 4. Effect of storage period on germination and seed infection by *Lasiodiplodia theobromae* on bottle gourd.

ii. *Macrophomina phaseolina*: The results indicated that the fungus survived up to 12 month in cucumber seed and 13 month in bottle gourd seeds at room temperature (Fig. 5). There was significant reduction in seed infection by *M. phaseolina* as the storage period increased in both crops. After 5 months of storage, *M. phaseolina* infection was 50 and 30% on seeds of bottle gourd and cucumber respectively. Similarly Songa & Hillock (1998) reported that the storage of *M. phaseolina* in infected bean seeds for 6 month decreased the number of infected seeds by up to 50%. Seed germination in infected seeds gradually decreased and was zero after 7 month in cucumber and 9 month in bottle gourd.

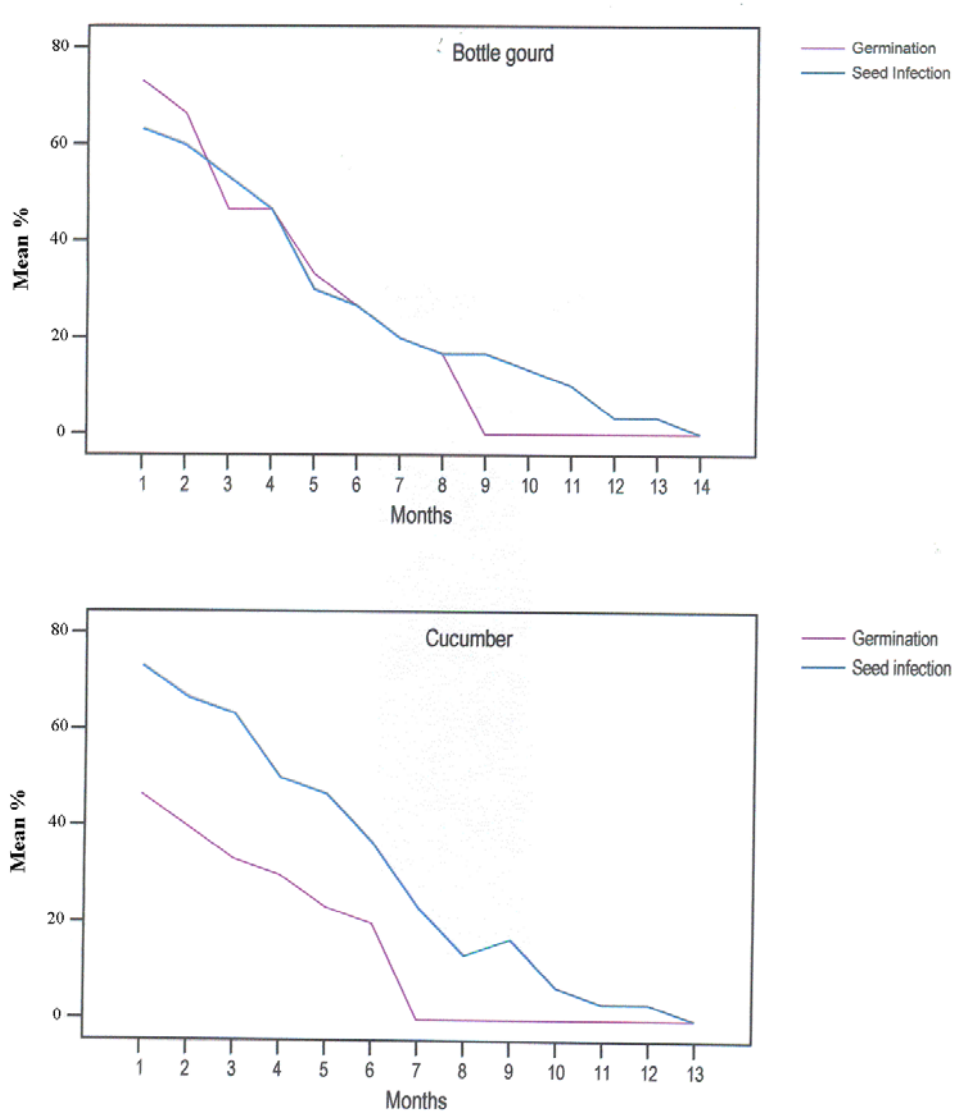

Fig. 5. Effect of storage period on germination and seed infection by *Macrophomina phaseolina* on bottle gourd and cucumber.

The survival of *Macrophomina phaseolina* on seeds of bottle gourd and cucumber varied where up to 50% survival was noticed after 5th to 6th months of storage. Similar observation was made by Songa & Hillocks (1998) in bean seed storage where 50% survival of *M. phaseolina* was observed after 6 months of storage. *M. phaseolina* has been reported to survive for 37 months on seed stored at 25-35^{o}C and for 93 months at 5^{o}C (Maholay, 1992) and also recorded on 16 crops and in seed lots stored in refrigerator for >9 years (Jeyanandarajah,1991). There is need for proper storage of seed samples for their protection from seed borne fungi.

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