J. Agrofor. Environ. 2(1): 1-6, 2008 ISSN 1995-6983

Environment safe storage technique of Chilli seed

M. Ayub Ali, A.K.M A. Aziz[1], and M.M. Haque
Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh,
[1]Deputy Manager, Seed Processing & Preservation Division, BADC, Dhaka.

Abstract: Seed treatment with fungicide is a common practice for controlling seed-borne diseases which cause pollution to environment; while plant extract may be the alternative agent to treat the seed without any hazard to mammal and beneficial microbes. Thus, the effect of lemon grass extract at different dilutions on the seed health and germination of chilli seed was evaluated. Four dilutions as 1:1, 1:2 and 1:3 of lemon grass extract including a control (water) were tested. Seeds were dipped in the extract of lemon grass for six hours, air-dried and then sun dried to 12-13% moisture content. The treated seeds were preserved in different containers such as tin, polythene, plastic and gunny bag. Health and germinabilty was assayed following ISTA rules. Lemon grass extract at 1:1 dilution showed highest germination and effectively controlled *Colletotrichum capsici, Fusarium mondiforme, Aspergillus sp, Curvularia lunata, Altemaria tenuis and Cladosporium* spp. associated with chilli seeds. With the increase of storage period, percent germination decreased and incidence of storage fungi increased gradually. The highest germination and lowest seed-borne infection was observed in seeds stored in Tin and maximum in Gunnys bag. Chilli seed treated with lemon grass extract at 1:1 dilution and preserved in sealed Tin container retained good health and high germinabilty without creating hazards to the environment, microbes and mammal.
Key Words: Lemon grass, dilution, container, storage, health and germinabilty.

Introduction

Chilli (*Capsicum annuum* L.) is one of the important spices rich in vitamin-C occuping the second position next to onion. Chilli is known to suffer from 83 different diseases of which 31 are seed borne or seed transmitted (Sharma, 1985). Fruit rot and anthracnose are serious problem for chilli cultivation. The causal agent of these diseases are seed-borne in nature (Talukdar, 1974). Seed borne pathogens reduce the germinability act as primary inoculum for spread in the crop field. Seed treatment with fungicide is a common practice to control the seed-borne pathogens. Fungicides cause environmental pollution and destruction of beneficial microbes in the soil (Ahmed and Sultana, 1984).

Use of plant extracts is an alternative agent for seed treatment which is safe to the environment as well as to beneficial microbes. It also reduces risk of application due to lack of toxicity to mammals and is successfully used against many fungal pathogens (Ashraffazzaman and Hossain, 1992). In our country some plants have been identified with anti-fungal properties (Khan and Hossain, 1993). In Bangladesh very limited research has been done on the control of fungi transmitted through the seeds of the crop (Mrida and Chowdhury,).

On the other hand, preservation of seeds in suitable container under congenial storage conditions can maintain good health and germination of seed. From harvesting to sowing, approximately five months, the seeds of chilli are kept in storage in farmer's house. Infection of the pathogen, germinability and moisture content of the stored seeds are affected by conditions and duration of storage (Pasha *et al.* 1984). Temperature and Relative humidity of the storage have a great effect on the health and germination of chilli seed. Air tight or sealed container is the best for chilli seed storage (Islam and Ali, 1982). In view of above facts the present study was undertaken to determine the effect of different dilution of lemon-grass-extract and different storage containers on seed borne infection and germinability of the stored chilli seed.

Materials and Methods

The experiments were conducted in the laboratory and greenhouse of Seed Pathology Centre, Bangladesh Agricultural University, Mymensingh. The seed sample of chilli was collected from the Mausumy Beej Bitan, Natun Bazar, Mymensingh. Matured green leaves of lemon grass *(Cymbopogon citratus)* collected from the field were washed under running tap water, surface dried, chopped into small pieces and weighed by an electric balance. The extract was prepared by grinding in a mortar and pestle followed by crushing the plant parts in an electric blender with distilled water. About 100g lemon grass leaves were crushed in 100 ml water to have an extract of 1:1 dilution. Similarly the dilutions of 1:2 and 1:3 were prepared. The mixture were filtered through cheese cloth. The extracts were contained in conical flasks separately and were kept in a refrigerator at $4 \pm 1^{O}C$ for use in the study. Seed samples of chilli were dipped in plant extract contained in petridish for 6 hours. Then the plant extract was drained out from the petridishes. The treated seeds were dried on blotting papers for six hours. A set of control was maintained by dipping the seeds in tap water. Four hundred seed were randomly taken from each dilution of plant extract and seed-borne pathogens were detected following blotter incubation technique (ISTA, 2001). Three layers of wet filter paper were placed at the bottom plastic petridishes and 25 seeds were placed on it. Four plates were considered as one replication. There were four replications for each treatment. The experiment was laid out in CRD. The seeds were incubated for 7 days at $20\pm2^{0}C$ under 12/12 hours alternatives cycles of NUV light and darkness. Individual seed was examined under stereomicroscope for detecting the pathogens. Seed borne infection was determined by counting the number of infected seeds. Germination test was carried using sand in plastic trays following

ISTA rules (ISTA, 2001). The trays were filled with sterilized moist sand. Four hundred seed were selected randomly from each treatment. Seed were sown in four lines at 25 seeds/line. The experiment was laid out in CRD with four replications. One tray was considered as one replication. Germination was recorded at 14 days after sowing. Number of normal, abnormal seedlings and dead seeds were counted separately and expressed in percentage. Eight hundred grams of seeds were treated with each dilution of seeds dried at 12% moisture content. The seeds were stored in different indigenous/ synthetic containers viz. Tin, Plastic (boyum), polythene-bag and Gunny-bag. Two hundred grams of treated seeds were kept in each container. The experiment was laid out in CRD with four replications. The treated seed were subjected to health test following blotter method at different periods of storage. The data were subjected to statistical analysis (ANOVA) and the significance of mean difference among the different parameters was judged by Least Significant Difference (LSD) done with the help of MSTAT soft ware in a computer.

Results and Discussion

Different seed borne fungi such as *Alternaria tenuis, Aspergillus niger, Colletotrichum capsic, Curvularia lunata and Fusarium moniliformae* were detected from chilli seed samples. Different dilutions of lemon grass extract showed significant effect on the incidence of these fungi (Table 1). The dilution 1:1 of lemon grass extract was effective for controlling seed borne fungi of chilli and allowed only 1.25-3.2% infection of different fungi in contrast to 7.75-17.50% in untreated seed.

Table 1. Effect of different dilutions of lemon grass extract on the incidence of seed borne pathogens of chilli seeds and seed germination

Dilution	Germination	% Incidence of seed borne fungi				
		Alternaria tenuis	*Aspergillus spp.*	*Colletotrichum capsici*	*Curvularia lunata*	*Fusarium moniliforme*
1:1	79.50 a	1.25d	2.00c	3.25 c	3.00 b	3.25 d
1:2	73.25 b	3.50c	4.25 b	5.00 bc	4.75 b	5.50c
1:3	68.75 c	5.25b	5.25 b	6.50 b	6.25 a	7.25 b
Control	55.50d	7.75	14.25 a	17.50 a	7.75 a	11.75 a
LSD	4.492	0.75	1.38	2.26	1.25	1.16

Means followed by the same letter in a column did not differ significantly at the 5% level by LSD.

Per cent germination of chilli seed showed significant variation among different dilution of lemongrass extract. Seed germination was maximum (79.50%) in 1:1 dilution and minimum (55.50%) in untreated seeds. There was 73.25% and 68.75% germination in 1:2 and 1:3 dilution of lemon grass extract, respectively (Table 1). Health status of stored seed had relationship with the storage period and seed container. Minimum infection (16.25%) was recorded in Tin container and maximum (32.25%) in Gunny-bag at one month after storage, it increased to 32.5% and 51.50% , respectively, at four months after storage (Table 2).

Table 2. Total number of seed borne infections in various containers during different storage period

Container	% seed borne infection at			
	1 month	2 month	3 months	4 month
Tin	16.25 d	20.25 c	23.25 d	32.5 d
Plastic	19.50 c	23.25 c	28.5 c	36.25 c
Polythene	27.50 b	29 b	31 b	40 b
Gunny bag	32.25 a	35 a	41.25 a	51.50 a
LSD at 5%	2.81	3.016	2.353	2.813

Means followed by the same letter in a column did not differ significantly at the 5 % level by LSD.

The association of *Alternaria tenuis* ranged 3.25-5.00% at one month after storage in different containers. It gradually increased as the time of storage increased. Infection was low in Tin container (Table 3). At four month of storage, *Alternaria tenuis* infection was 5.50 %, 6.75%, 6.75% and 8.75%, respectively, in Tin, Plastic Polythene and Gunny-bag. The rate of infection of *Colletotrichum capsici* differed significantly depending on containers and length of storage. Incidence of this pathogen was 2.00% - 4.75% in Tin during the storage period as compared to 5.00% - 6.75% in Gunny bag (Table 3). There was no infection of *Cladosporium spp* in Tin at one month of storage; while this infection was 4.5% at four months of storage. In Gunny-bag, infection was 8.75%, which was 5.75% and 6.50%, respectively, in Plastic-

container and Polythene-bag at four month after storage (Table 3).The highest germination (85.50%) was recorded in Tin while the lowest (62%) in Gunny bag at one month of storage. Similar trend was observed during the entire storage period.

Five different fungi viz. *Altemaria tenuis, Aspergillus spp, Colletotrichum capcisi, Curvularia lunata, Fusarium moniliforme,* detected from stored chili seed have support both at home and abroad (Shaw, 192 1). Lemon grass extract at 1: 1 dilution ratio showed best performance. The treated seeds were stored in different containers viz. Tin container, Plastic container, Polythene-bag, Gunny-bag kept in a room where the temperature and relative humidity during 4 months of storage period ranged from 29- 35^0C and 68-89%, respectively. The germination and seed borne infection varied depending on container and length of storage. The highest germination (88.50%) was recorded in Tin at four months of storage. The lowest germination was recorded in Gunny-bag (48.00%**).** The moisture content of the seed varied from 12.00-17.30 %. The increase in seed moisture content may be the cause of higher seed infection by fungi and consequently reduction in germination (Islam and Ali, 1981). Similar reduction in germination was reported in the stored seeds of other crops (Mian and Fakir, 1977).

Table 3. Prevalence of seed borne fungi in chilli seed stored in different types of containers during storage period.

Container	% seed borne infection of											
	Alternaria tenuis				*Colletotrichum capsici*				*Cladosporium spp*			
	1 month	2 month	3 months	4 month	1 month	2 month	3 month	4 month	1 month	2 month	3 month	4 month
Tin	3.25 c	2.50 d	4.25 c	5.50 d	2.0 d	3.50 c	3.25c	4.75 b	0.00 d	2.0 c	2.25 d	4.50 b
Plastic	4.25 b	5.25 b	5 bc	6.75 c	3.0 c	3.25 c	5.0 b	5.50 ab	2.0	2.25 c	3.0 c	5.75 b
Polythene	5.25 a	4.55 c	6 ab	6.75 b	4.0 b	4.25 b	5.0 b	6.75 a	3.25 b	3.0 b	4.0 b	6.50 a
Gunny bag	5 a	6 a	7.25 a	8.75 a	5.25 b	5 a	6.75 a	6.75 a	4.0 a	5.0 a	5.25 a	8.75 a
LSD at 5%	0.384	0.506	1.44	0.718	0.449	0.583	0.619	0.709	0.472	0.467	0.487	1.161

Means followed by the same letter in a column did not differ significantly at the 5 % level by LSD.

Chilli seed stored in different containers for various period of time showed that Tin and Plastic container maintained fairly satisfactory germinability and good health up to four months of storage. Variation in germination of seed stored in different containers probably due to quality of the containers. Haque (1982) reported the suitability of Metal-container over Gunny-bag in keeping the higher germination of rice seed. Eswarappa *et* al. (1991) also reported the similar results. They showed higher quality of seed stored in Tin compared to Gunny-bag with respect to germination and biotic infestation, although the seed moisture content was similar. Moisture content of the seed in different containers varied. The lower range of moisture content of seeds stored in Tin-container probably help to maintain the seed quality during the storage period. Gunny-bag was not air tight. That might help develop increased seed moisture. The present results are in agreement with Ching et. al. (1960) who opined that initial seed moisture plays a vital role keeping the seed viability. According to them such increase in moisture was high in permeable container. So, it can be concluded that chilli seed treated with lemon grass extract at 1:1 dilution preserved in sealed tin container retained good health and high germinabilty without hazards to the environment, microbes and mammal.

References

Ahmed, N. and Sultana, K. 1984. Fungitoxic effect of garlic on treatment of jute seed. Bangladesh J. Bot. 13(2):130-136.

Ashrafuzzaman, H. and Hossain, I. 1992. Antifungal activity of crude extracts of plants aganist *Rhizoctonia solanai* & *Bipolaris sorokiniana*.Proc.BAU Res.6: 188-192

Eswarappa, H., Ananthanarayana, R. and Krishnamurthy, K. C. 1991. Evaluation of different storage structure for paddy. Current Research-University of Agricultural Sciences. Bangladesh, India 20(1):pp.8-9

Haque, 1982. Studies on viability and vigor of BR8 and BR9 rice seeds. Workshop on modern rice cultivation in Bangladesh held at BRRI, Gazipur.

Islam, A. K. M. N. and Ali, M. K. 1981. Effect of relative humidity on the keeping quality of jute seed at room temperature. Bangladesh J. Agril. 6(2-3):50-54.

Khan, M. H. H. and Hossain, I. 1993. Antifungal activity of crude plant extracts against *Bipolaris sorokiniana*. Paper presented 5th Biennial conference. Bangladesh Phytopathoilogical Society, 27-28 June-1993. BAU, Mymensingh. 10p.

Mian, F. H. and Fakir, G. A. 1977. Fungi of rough rice grains during storage and thier relationship with germinability. Ann. Sci. Cont., BAAS. Section of

Biol. Bot. Zool. Entom. Fish and Microb. Abstract 2:21-22

Mridha, M. A. U. and Chowdhury, M. A. U. 1990. Efficacy of some fungicide against seed borne infections of chilli fruit rot fungi. Seed Research, 18(1):98-99

Pasha, M. K., Salehuzzaman, M., Malik, A. U. and Das R. K. 1984. The influence of storage conditions upon the germination of some crop. Bangladesh J. Phytoath. 8(2):53-56.

Sharma, A. K. 1985. Studies on seed borne inoculum of *Colletotrichum capsici* causing ripe fruit of chillies in the kumaon hills. Seed and farms 11(2): 25-26.

(RPP. 58-434).

Takukdar, M. J. 1974. Plant diseases in Bangladesh. Bangladesh. J. Agril. Res. 1(9):61-86