OPEN ACCESS

International Journal of Applied Sciences and Biotechnology

A Rapid Publishing Journal

ISSN 2091-2609

Available online at:

http://www.ijasbt.org

&

http://www.nepjol.info/index.php/IJASBT/index

Indexing and Abstracting

CrossRef, Google Scholar, Global Impact Factor, Genamics, **Index Copernicus**, **Directory of Open Access Journals**, International Society of Universal Research in Sciences (EyeSource), Journal Seeker, Socolar, BioRes, Indian Science, Jadoun Science, Jour Informatics, Journal Directory, JournalTOCs, Academic Journals Database, Journal Quality Evaluation Report, PDOAJ, Science Central, Journal Impact Factor, NewJour, Open Science Directory, DRJI, Global Institute of Scientific Information, Open Access Library, IIJS, Sciseek, Cabell's Directories, Scientific Indexing services, CiteFactor, Unisa, InfobaseIndex, Infomine, Getinfo, Open Academic Journals Index etc.

SEM-Biotech Publishing

IC Value: **4.37**

I. Hossain et. al. (2014) Int J Appl Sci Biotechnol, Vol 2(1): 103-108
DOI: 10.3126/ijasbt.v2i1.9926

ISSN (Online): 2091-2609
DOI Prefix: 10.3126/ijasbt

International Journal of Applied Sciences and Biotechnology (IJASBT)

Research Article

QUALITY OF VEGETABLE SEEDS COLLECTED FROM MYMENSINGH REGION IN BANGLADESH

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Abstract

Seed quality and health status of 11 vegetable crop seeds of viz. Cabbage (*Brassica oleraceae* var. *capitata*), Indian cabbage (*Brassica* oleraceae var. indica), Indian spinach (*Basella alba*), Spinach (*Beta vulgaris* var. *bengalensis*), Red amaranth (*Amaranthus tricolor*), Bitter gourd (*Momordic acharantia*), Bottle gourd (*Lagenaria siceraria*), Sweet gourd (*Cucurbita moschata*), Carrot (*Daucuscarrota* var. *sativa*), Radish (*Raphanus sativus*), and Turnip (*Brassica rapa*) collected from the greater Mymensingh region of Bangladesh were tested. The germination percentage of seeds of the collected samples ranged from 11 to 100. The highest germination was recorded in indian cabbage (100%) followed by carrot (92%) and radish (90%), while the lowest was recorded in indian spinach seeds (11%). Altogether 10 fungi were found associated with the seeds which were *Alternaria* spp., *Aspergillus flavus, Aspergillus niger, Botrytis cinerea*, *Chaetomium funicola*, *Curvularia* spp., *Fusarium* spp., *Penicillium* spp., *Phoma* spp. and *Rhizopus* spp.. The highest total seed-borne fungal infection was found in bottle gourd (155%) followed by sweet gourd (145%). The lowest infection was found in turnip seeds (6%). The maximum number of dead seeds was found in indian spinach (89%) and no dead seed was found in indian cabbage. Among the vegetables seed samples, seedling vigour ranged from 59 to 3083, where the highest seedling vigour was observed in sweet gourd (3083) and the lowest was in indian spinach (59).

Keywords: Vegetable seed; Health; Germination; Vigour

Introduction

Vegetables constitute a potential and important group of crops in Bangladesh. They are important for their low production cost, short duration of production and high nutritive value. Seed is the vital input in agriculture. Among the agricultural inputs, seed is the most important input for crop production. Quality and healthy seed is the crying need of the day. Healthy or pathogen free seeds of good quality are considering as the vital factor for desired plant population and good harvest. Health of seeds can be affected by direct infection of pathogens or through contamination of seeds by pathogenic propagules as contamination in, on or with the seeds or as concomitant contamination (Rashid and fakir, 2000). Infection of seed by pathogenic organisms and presence of propagules of pathogen in a seed lot is vitally important because of germination failure and subsequent infection to seedlings and growing plants. That's why good and healthy seed is considered as important factor for successful crop production. Seeds of vegetables are more vulnerable to attack by pathogens and quickly deteriorate in storage. Their inherent quality can not be assessed easily just from their external appearances. For good crop, good seed is essential which indicate that the seed should be pure, viable and healthy. Use of good seeds can contribute to increase vegetable yield as high as 30% remaining all other factors of production as content (Khanom, 2011). Seeds of different vegetables of Mymensingh region of Bangladesh had not been thoroughly studied earlier. As a result quality of vegetable seed under this region is not known to farmers, researchers as well as seed producing farms. Considering the above facts, the present research was undertaken to assess the health and quality of vegetable seeds collected from the Mymensingh region.

Materials and Methods

Seeds of different vegetables under Mymensingh region were collected from Bismillah beez vander, Krishan Agro service, New Mousumi beez vander, Sharika seed store, Al-Madinabeez vander, Al-Amin beez vander, Yasin beez vander, Mousumi beez bitan, Arian seed company, Krishi beez vander, Angkur beez bitan and Islamia beez vander. All experiments were conducted at Seed Pathology Centre, Bangladesh Agricultural University, Mymensingh during the period from 2010 to 2011. Seeds of three different

categories of vegetables were studied for their health and quality. The categories of vegetables were i) Leafy vegetables viz. Cabbage, Indian cabbage, Indian spinach, Spinach and Red amaranth, ii) Cucurbits viz. Bitter gourd, Bottle gourd and Sweet gourd and iii) Root vegetables viz. Carrot, Radish and Turnip. A working sample of 400 seeds was used for Blotter test for detection of seed-borne fungi following the International Rules for Seed Testing (ISTA, 2001). Growing on test was conducted with 200 seeds for germination, normal seedlings, abnormal seedlings, diseased seedlings and dead seeds that were recorded thrice at 7, 14, 21 days after sowing. For determination of seedlings vigour of vegetables, 10 seedlings per replication were selected randomly and their individual shoot and root length were measured. The vigour of the seedlings was determined by the following formula of Baki and Anderson (1972).

The experiments were conducted in Randomized Complete Block Design (RCRD) with four replications and data were analyzed by using statistical package program MSTAT-C. The level of significance and analysis of variance along with the Least Significant Difference (LSD) were done following Gomez and Gomez (1984).

Results and Discussion

The prevalence of different vegetables seed (11 vegetable crops) collected from different seed shops of Mymensingh region were recorded and presented in table 1. Vegetable seeds yielded nine genera viz. *Alternaria* spp., *Aspergillus spp., Botrytis cinerea, Chaetomium funicola, Curvularia* spp., *Fusarium* spp., *Penicillium* spp., *Phoma* spp. and *Rhizopus* spp. Among these fungi, eight were detected from leafy vegetable seeds (Table 1), fungi in order of prevalence were *Fusarium* spp. (16.1%), *Phoma* spp. (6.3%), *Aspergillus flavus* (3%), *Alternaria* spp. (2.9%), *Aspergillus niger* (2.9%), *Penicillium* spp. (1.6%), *Rhizopus* spp. (1.5%) and *Curvularia* spp. (0.7%).In case of, *Alternaria* spp., maximum prevalence (6%) was recorded in seeds of cabbage, but spinach seeds were free from *Alternaria* spp.. Maximum prevalence of *Aspergillus flavus* was recorded in indian cabbage (7%), while spinach seeds had no *Aspergillus flavus* incidence. The prevalence of *Aspergillus niger* was highest in indian cabbage (6.5%), but not in red amaranth. The fungi *Curvularia* spp. and *Phoma* spp. were recorded only in indian spinach (3.5%) and spinach (31.5%), respectively. In case of *Fusarium* spp., maximum prevalence was recorded in seeds of indian spinach (50.5%) and minimum in red amaranth (2%). The highest prevalence of *Penicillium* spp. was recorded in red amaranth (5%) but not found in spinach and indian cabbage. In case of *Rhizopus* spp., maximum incidence was recorded in indian spinach (4.5%), but indian cabbage and red amaranth seeds were free from *Rhizopus* spp.. The highest total seed-borne fungal infection was observed in indian spinach (68.5%) followed by spinach (54%). In this case most predominant fungus was *Fusarium* spp. (16.1%) followed by *Phoma* spp. (6.3%), *Aspergillus flavus* (3%), *Alternaria* spp. (2.9%), *Aspergillus niger* (2.9%), *Penicillium* spp. (1.6%), *Rhizopus* spp. (1.5%) and *Curvularia* spp. (0.7%). Of all these fungi recorded in seeds of leafy vegetables, *Aspergillus flavus*, *C. spinaceae* and *Penicillium* spp. were reported in Bangladesh by Islam (2005). Good number of seed borne fungi of leafy vegetables has also been reported by Richardson (1990). Four different fungi viz. *Alternaria* spp., *Aspergillus* spp., *Fusarium* spp. and *Penicillium* spp. were found in seeds of red amaranth. Among these fungi, *A. spp*., *A. niger*, *Colletotrichum capsici*, *Fusarium* spp., *Penicillium* spp. and *Rhizopus stolonifer* were reported in seeds of the crops by Islam (2005). Richardson (1990) reported only one fungal species *Alternaria amaranthi* in the seeds of *Amaranthus* spp.

Fungi detected in seeds of Cucurbits collected from different seed shops of Mymensingh region are also presented in Table 1. Prevalence of total seed-borne fungal infections varied significantly depending on the seed of different vegetables. In case of *Aspergillus flavus* and *Aspergillus niger*, maximum prevalence was recorded in bottle gourd (31% and 27%) and minimum in sweet gourd (25% and 19%). The highest incidence of *Botrytis cinerea* was recorded in bottle gourd (12.5%), but seeds of bitter gourd were free from *Botrytis cinerea*. Maximum incidence of *Chaetomium funicola* was recorded in bitter gourd (6.5%) but seeds of sweet gourd were free from *Chaetomium funicola.*The highest prevalence of *Fusarium* spp was recorded in sweet gourd (58.5%) and lowest in bitter gourd (18.5%). Highest incidence of *Penicillium* spp. was found in bitter gourd (28%) and lowest in sweet gourd (2%).Maximum *Rhizopus* sp. was recorded in sweet gourd (32%) and lowest in bitter gourd (16%). The highest total seed-borne fungal infection was observed in bottle gourd seed (155%) followed by sweet gourd (145.5%), while the lowest seed borne infection was recorded in seeds obtained from bitter gourd (123.5%). The most predominant fungi were *Fusarium* sp (38.7%), followed by *Aspergillus flavus* (28.5%), *Rhizopus* spp. (25.2%), *Aspergillus niger* (23.7%), *Penicillium* spp. (14.7%), *Botrytis cinerea* (7%) and *Chaetomium funicula* (3.7%). Peregrine *et al*. (1984) and Peregrine and Ahmed (1983) reported that the fungi *Aspergillus* spp., *Rhizopus* spp., *Cladosporium* spp., *Helminthosporium* spp., *Alternaria* spp., *Fusarium* spp., *Curvularia* spp., *Penicillium* spp., *Botrytis* spp., *Verticillium* spp., *Cylindrocephalum* spp., *Colletotrichum* spp., *Corynespora* spp. and *Ascochytula* spp. were associated with seeds of cucurbits. On the other hand, Sultana (2009) reported *Aspergillus* spp., *Curvularia* spp., *Colletotrichum* spp., *Fusarium* spp., *Penicillium* spp. and *Botrytis* spp. as seed-borne fungi of vegetabe.

Table 1: Prevalence of seed-borne fungi of different vegetable seeds (Blotter method)

Seed categories	Vegetables	% seed borne infection										Total seed borne fungal infections (%)
		Alternaria spp.	*Aspergillus flavus*	*Aspergill-us niger*	*Botrytis cinerea*	*Chaeto—mium funicola*	*Curvulari-a* spp.	*Fusarium* spp.	*Phoma*spp.	*Penicilli-um* spp.	*Rhizopus* spp.	
Leafy vegetables	Cabbage	6.0	2.0	2.5	-	-	0.0	4.0	0.0	1.5	1.5	17.5
	Indian cabbage	3.0	7.0	6.5	-	-	0.0	7.5	0.0	0.0	0.0	24
	Indian spinach	3.0	4.5	1.0	-	-	3.5	50.5	0.0	1.5	4.5	68.5
	Spinach	0.0	0.0	4.5	-	-	0.0	16.5	31.5	0.0	1.5	54
	Red amaranth	2.5	1.5	0.0	-	-	0.0	2.0	0.0	5.0	0.0	11
	Total average	2.9	3	2.9	-	-	0.7	16.1	6.3	1.6	1.5	35
	Lsd (P ≥0.05)	1.03	0.68	4.87	-	-	2.27	1.91	1.01	3.87	4.23	
Cucurbit vegetables	Bottle gourd	-	31.0	27.0	12.5	4.5	-	39.0	-	14.0	27.0	155.0
	Bitter gourd	-	29.5	25.0	0.0	6.5	-	18.5	-	28.0	16.0	123.5
	Sweet gourd	-	25.0	19.0	8.5	0.0	-	58.5	-	2.0	32.0	145.0
	Total average	-	28.5	23.7	7.0	3.7	-	38.7	-	14.7	25.2	141.3
	Lsd(P ≥0.05)	-	4.1	2.9	3.4	7.3	-	4.9	-	2.2	4.6	
Root vegetables	Carrot	5.5	0.0	2.5	-	-	0.0	4.5	-	1.0	-	13.5
	Radish	4.5	5.0	3.0	-	-	3.5	10.5	-	1.5	-	28.0
	Turnip	0.0	0.0	0.0	-	-	0.0	2.5	-	3.5	-	6.0
	Total average	3.3	1.7	1.8	-	-	1.2	5.8	-	2.0	-	15.8
	Lsd (P ≥0.05)	1.36	6.38	0.74	-	-	5.88	2.74	-	3.32	-	

- , Not found

In case of seeds of root vegetables, six fungi were found associated (Table 1), namely *Fusarium* spp. (5.8%), *Alternaria* spp. (3.3%), *Penicillium* spp. (2%), *Aspergillus niger* (1.8%), *Aspergillus flavus* (1.7%) and *Curvularia* spp. (1.2%).Maximum incidence of *Alternaria* spp. was found in carrot (5.5%), but seeds of turnip were free from *Alternaria* spp.. In case of *Aspergillus niger*, the highest prevalence was recorded in radish (3%), but no incidence in turnip. *Aspergillus flavus* (5%) and *Curvularia* spp. (3.5%) were found only in radish. Maximum prevalence of *Fusarium* spp. was recorded in radish (10.5%) and minimum in turnip (2.5%). The incidence of *Penicillium* spp. was high in turnip (3.5%), while low in carrot (1%). The highest total seed-borne fungal infection was observed in radish (28%) followed by carrot (13.5%), while the lowest seed borne infections were recorded in seeds obtained from turnip seed (6%).In this case, most predominant fungus was *Fusarium* spp. (5.8%) followed by *Alternaria* spp. (3.3%), *Penicillum* spp. (2%), *Aspergillus niger* (1.8%), *Aspergillus flavus* (1.7%) and *Curvularia* spp. (1.2%).

Out of seeds of 11 crops studied, The highest total seed-borne fungal infection was found in bottle gourd (155%) followed by sweet gourd (145%), while the lowest was found in turnip (6%) followed by red amaranth (11%). Among all the fungi detected in the present study, *Alternaria* spp., *Botrytis cinerea*, *Curvularia* spp. and *Chaetomium funicola* are known pathogens of various crops (Richardson, 1990).

In growing-on-test, number of normal seedlings, number of abnormal seedlings, number of diseased seedlings and dead seeds varied significantly depending on seed of different vegetables (Table 2). The highest number of normal seedlings were recorded in seeds of indian cabbage (100%) followed by carrot (86%) and radish (86%), while the lowest was recorded in indian spinach seeds (7%). The highest number of abnormal seedlings was found in sweet gourd (14%), while abnormal seedling was not found in indian cabbage. The highest number of diseased seedlings was recorded in sweet gourd (8%) and no diseased seedlings were found in indian cabbage, indian spinach and carrot. The notorious fungi, *Fusarium* spp. cause seedlings infection (foot and root rot disease). *Fusarium* spp. is an established seed-borne pathogen capable of causing germination failure/ seed rot, damping-off, seedling blight foot and root rot and wilts in many crops (Mathur*et al*. 1975; Richardson, 1990). Maximum number of dead seed was found in indian spinach (89%), while dead seeds were not found in indian cabbage

Table 2. Growing-on-test of seeds of different vegetables

Seed categories	Name of vegetables	Normal seedlings (%)	Abnormal seedlings (%)	Diseased seedlings (%)	Dead seeds (%)
Leafy vegetables	Cabbage	66	10	6	18
	Indian cabbage	100	0	0	00
	Indian spinach	7	4	0	89
	Spinach	70	6	6	18
	Red amaranth	75	11	3	11
Cucurbit vegetables	Bottle gourd	43	6	5	46
	Bitter gourd	54	4	4	38
	Sweet gourd	62	14	8	16
Root vegetables	Carrot	86	6	0	8
	Radish	86	2	2	10
	Turnip	64	5	3	28
Lsd (P ≥0.05)		1.780	0.9595	0.691	1.708

Table 3. Germination and seedling vigour test of different vegetable seeds (Growing on test)

Name of vegetables	Germination (%)	Shoot length (cm)	Root length (cm)	Vigour index
Bitter gourd	62.00	20.36	12.53	2039.18
Bottle gourd	54.00	6.470	5.640	653.94
Cabbage	82.00	9.900	1.420	928.24
Carrot	92.00	5.100	1.170	576.93
Indian cabbage	100.0	1.680	5.930	761.0
Indian spinach	11.00	4.250	1.150	59.4
Radish	90.00	9.960	1.420	1024.20
Red amaranth	89.00	7.300	1.450	778.75
Spinach	82.00	6.670	1.630	680.76
Sweet gourd	84.00	26.23	10.47	3082.8
Turnip	72.00	10.64	1.590	880.56
Lsd (P ≥0.05)	2.339	0.7424	0.4263	5.673

10 seedlings per replication were counted for evaluating vigour index

Significant variation of seedling vigour was recorded on testing seedling vigour of 11 vegetable seeds (Table 3). Among the vegetables seed samples, highest seedling vigour was encountered in sweet gourd (3083) and the lowest in indian spinach (59). The highest germination percentage in growing-on-test was recorded in indian cabbage (100%) and lowest in indian spinach (11%). Shoot length was highest in sweet gourd (26.23) and lowest in indian cabbage (1.68). Root length was highest in bitter gourd (12.53) and lowest in carrot (1.17). There was significantly difference among the seeds of different vegetables in respect of % germination, shoot length, root length and vigour index.

Conclusions

From the findings of the present study, it may be concluded that the seed samples of different vegetables collected from Mymensingh region are not so good quality except indian cabbage, radish and carrot. Therefore, routine seed health and quality study should be undertaken in order to reveal the exact picture regarding the prevalence of seed-borne fungi and the role they do play on seed health.

Acknowledgements

The authors thankfully acknowledge Seed Pathology Centre, Bangladesh Agricultural University, Mymensingh, Bangladesh for providing lab. facilities of conducting the research.

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