Reprint **ISSN 1991-3036 (Web Version)**

International Journal of Sustainable Crop Production (IJSCP)

(*Int. J. Sustain. Crop Prod.*)

Volume: 15 **Issue: 1** **May 2020**

Int. J. Sustain. Crop Prod. 15(1): 1-6 (May 2020)

QUALITY OF VEGETABLE SEEDS AS INFLUENCED BY VARIOUS SOURCES OF COLLECTION

H. BANU, N. AKTER, B.C. HALDER , M.A. KABIR, M.S. ISLAM AND M.M. ALI

An International Scientific Research Publisher

Green Global Foundation©

Web address: http://ggfjournals.com/e-journals archive

E-mails: editor@ggfjournals.com and editor.int.correspondence@ggfjournals.com

ISSN-1991-3036 (Online)
Int. J. Sustain. Crop Prod. 15(1):1-6(May 2020)

QUALITY OF VEGETABLE SEEDS AS INFLUENCED BY VARIOUS SOURCES OF COLLECTION

H. BANU[1], N. AKTER[1]*, B.C. HALDER[1] , M.A. KABIR[1], M.S. ISLAM[2] AND M.M. ALI[3]

[1]Department of Horticulture, Hajee Mohammad Danesh Science and Technology University, Dinajpur; [2]BRAC Agricultural Research and Development Center, Gazipur, Bangladesh; [3]Department of Agroforestry and Environment Hajee Mohammad Danesh Science and Technology University, Dinajpur.

*Corresponding author & address: Nazmin Akter, E-mail: nazminhstu143@gmail.com
Accepted for publication on 5 May 2020

ABSTRACT

Banu H, Akter N, Halder BC, Kabir MA, Islam MS, Ali MM (2020) Quality of vegetable seeds as influenced by various sources of collection. *Int. J. Sustain. Crop Prod.* 15(1), 1-6.

An experiment was conducted at the Department of Horticulture, Hajee Mohammad Danesh Science and Technology University, Dinajpur from May to June 2017 to evaluate the qualities of different vegetable seeds from various sources. The experiment was comprised five sources of crop seeds *viz*., Supreme Seed Company (T_1), seeds produced by Krishi Banijjo Prothisthan (T_2), seeds of Metal Agro Limited (T_3), seeds of BRAC Seed Enterprise (T_4) and seeds of local seed traders (T_5), and three crops: C_1 (Radish), C_2 (Country bean) and C_3 (Brinjal) respectively. The experiment was laid out in the Completely Randomized Design with three replications. The parameters studied were percent moisture content, percent analytical purity, percent germination, percent of normal and abnormal seedling of three crops and seedling vigour in terms of root and shoot length, number of secondary roots, fresh and dry weight of shoot and roots. The result revealed that the maximum purity (95.67%), germination (96.67%) was found in BRAC Country bean seed and minimum moisture (6.37%) was found in Supreme Country bean seed. The highest shoot length, fresh weight of shoot and number of secondary roots per seedling were found in the combination of BRAC Country bean seeds. The longest root and shoot were found in the combination of seeds of Supreme with Country bean. Local Brinjal seeds performed least in case of shoot length, root length, fresh and dry weight of shoot. The study revealed that local seed traders should be trained – up about various aspects of quality vegetable seed production and marketing. Parallel to this, seed certification activities must be strengthened to assure the qualities of different vegetable seeds too.

Key words: *quality, vegetable seeds (radish, country bean, brinjal), different seed company*

INTRODUCTION

Vegetables are important sources of vitamins like A, C, niacin, riboflavin and thiamine, and minerals such as calcium and iron. They provide dietary fiber and they are essential to maintain health and cure nutritional disorders (Mandol 2013). They are important for their low production cost, short production period and high nutritive value. In 2015-2016 about 992 acres of land were under vegetable cultivation in Bangladesh and production was 3818 tons and yield 1557.635 kg per hectare (BBS 2017). Among theinputs, seed is the most important input for crop production. It may be called the foundation of agriculture. No agricultural practices (for example tillage cultivation, weeding, fertilizer, pest and disease control) can increase crop yields beyond the limit set by the seed quality. One of the main reasons of the poor yield of vegetable crops in the country is the use of poor quality vegetable seeds. The seed is, therefore, the baseline for success or failure of the crop planted. Use of good seeds can contribute for increasing vegetable yield as high as 30% remaining all other factors of production as constant (Khanom 2011). The Radish (*Raphanus raphanistrum* subsp. *sativus*) is an edible root vegetable of the Brassicaceae family that was domesticated in Europe in pre-Roman times. They germinate quickly and grow rapidly, smaller varieties being ready for consumption within a month, while larger daikon varieties take several months. In a 100 gram serving raw Radishes provide 16 calories and have a moderate amount of vitamin C (18% of daily value), with other essential nutrients in low content. Eggplant (*Solunum melongena* L.) is a plant of the family Solanaceae (also known as the nightshades) and from genus Solanum. Eggplant is well regarded among the vegetables increasingly sought by consumers, whose demand for food with potential health-promoting effects, such as disease prevention, is escalating (Cardoso *et al*. 2009). Country bean (*Lablab purpureus* L.) is one of the most important leguminous vegetables in Bangladesh. It is short-lived creeping perennial but used as an annual legume. It is a vigorously trailing, twining herbaceous plant. It is normally grown during the rabi or winter season. The green pods of legume and developed unripe seeds serve as delicious vegetables. Immature green seeds are eaten boiled or used curries, ripe seeds are also used as pulse, "dhal" (Sultana 2001). Seed quality is influenced by several factors during seed development such as maturation, harvesting, drying, cleaning, grading, packing and storage. The seed of popular or released varieties produced by the scientific method is referred to as quality seed (Singh 2011). Quality seeds germinate completely at a faster rate with vigorous seedlings of little sensitivity to climatic changes that enable them to adopt a broad range of environmental conditions (Corbineau and Come, 2006). Information on seed quality is also important for implementing effective breeding programs where higher-performing seeds are the starting point of selection. Thereore, farmers must plant the high-quality seed because they cannot recover the cost and time lost after planting has commenced. Cultivation of vegetables is carried out in intensive production systems and the success of this activity depends on the quality of seeds used. Farmers and growers are constantly looking for high-quality seeds to ensure uniform field establishment and increased production (Ventura *et al*. 2012). There are different sources of vegetable seeds in the market e.g. Bangladesh Agricultural Development Corporation (BADC), various Non-Government Organization like Bangladesh Rural Advancement Committee

(BRAC), various private companies like Lal Teer, Supreme, Metal Agro seeds and local seed traders. Bangladesh Agricultural Research Institute (BARI) and several seed companies are working on the development of new varieties of different vegetables. Bangladesh Agricultural Development Corporation (BADC) is mandated to produce foundation seed from breeder seed which is developed in BARI. Total vegetable seed requirement in Bangladesh is 383.82 kg/ha and improved vegetable seed is 40 thousand M ton's (BBS 2017). Presently BADC provides around 4.25% vegetable seeds to the farmers. The 90% seeds of vegetable are produced by our farmers. The informal seed systems constitute about 75-90% crop cultivation (Gill *et al.* 2013). Few research works are carried out in our country regarding the comparative qualities of vegetable seeds as obtained from different sources. However, results are variable to draw any valid conclusion. So, this needs more attention. With a view to the above facts, the present study was carried out to evaluate the quality of vegetable seeds collected from different sources.

MATERIALS AND METHODS

An experiment was carried out at the laboratory of Horticulture Department, HSTU, during May-June 2017 to evaluate the quality of vegetable seeds collected from different sources at the HSTU, Dinajpur. The conducted experiment comprises different sources of seeds such as, seeds of Supreme Seed Company (T_1), seeds of Krishi banijjo protisthan (T_2), seeds of Metal agro limited (T_3), seeds of BRAC seed enterprise (T_4) and seeds of local seed traders (T_5) and three crops were used as a treatment such as, C_1 (Radish), C_2 (Country bean) and C_3 (Brinjal). So the Treatment Combination was T_1C_1, T_1C_2, T_1C_3, T_2C_1, T_2C_2, T_2C_3, T_3C_1, T_3C_2, T_3C_3, T_4C_1, T_4C_2, T_4C_3, T_5C_1, T_5C_2, and T_5C_3. The experiment was laid out in Complete Block Design (CRD) with three replications. The quality parameters such as percent moisture content, percent analytical purity, germination percentage and seed vigour were estimated this experiment.

Statistical Analyses

The data obtained from the experiments from the laboratory were analyzed by using a standard statistical program (MSTAT-C) to illustrate the significances of the results. The means for all the treatments were calculated and the analyses of variances for all the components were performed by F-variance test. The differences between the pairs of the treatment means were evaluated by the Least Significant Differences (LSD) test with 5% level of significance for the interpretation of the results (Gomez and Gomez, 1984).

RESULTS

Seed Quality Test

Effect of Sources

The results on seed quality (% moisture, % purity, % germination) showed significant differences among the sources (Table 1). In this case, the topmost moisture content was (13.07%) retained by the local seeds (T_5), which was expressively different from the others retained. On the contrary, the least moisture content (8.839%) was recorded in seeds from Metal Agro Limited (T_3). Again, the highest percentage of purity (87.56%) was found in the seeds from Supreme Seed Company which were statistically different from other sources and the lowest percentage of purity (54.56%) was found in the seeds from local seed traders. Finally, the maximum germination percentage (92.10%) was found in the seeds from BRAC Seed Enterprise (T_4) and the minimum germination percentage (63.11%) was found in the seeds from local seed traders (T_5).

Influence on seed quality by different vegetable seeds

The seed quality (% moisture, % purity, % germination) showed great variations (Table 2). The highest percent of moisture was noted in Brinjal (12.46%) and the lowest was Radish seeds (9.005%). In the case of percent of purity, the highest percent of analytical purity (83.33%) was recorded in Country bean seed and the lowest percentage of purity (75.20%) was found in Radish seed. Further, the percent of germination showed great variation among the crops (Table 2). The maximum germination (87.37%) was recorded in Radish seed, which was significantly superior to the seeds of rest crops. The minimum germination (60.53%) was recorded in Country bean.

The combined effect of different sources and seeds on seed quality

A significant difference was found among different combinations of sources and crops on seed quality (Table 3). Among the combination, T_5C_3 gave the highest moisture content (15.61%) compared to other combinations and the lowest moisture content (6.367%) was found in T_1C_2. The maximum purity percent was obtained in T_1C_1 (96.67) followed by T_3C_2 (97.33), T_4C_2 (95.67), T_4C_3 (98.00) respectively and the lowest purity percent was obtained in T_5C_2 (51.00) combination. The Highest percentage of Germination was obtained in T_1C_1 (98.17), T_4C_2 (96.67), T_4C_3 (97.63) respectively whereas the lowest germination percent was retained in T_3C_2 (27.67).

Table 1**.** Main effect of different sources on seed quality of Radish, Country bean and Brinjal seeds

Treatments	Parameters		
	% Moisture	% Purity	% Germination
T_1	11.48b	87.56a	83.06b
T_2	9.67c	84.33b	69.33c
T_3	8.84e	82.11c	63.11d
T_4	9.31d	87.22a	92.10a
T_5	13.07a	54.56d	68.22c
LSD at 0.5	0.14	1.72	2.28
CV %	1.39	2.25	3.14

Note: T_1= Supreme Seed Company Ltd., T_2= Krishi banijjo protisthan, T_3= Metal agro limited, T_4= BRAC seed enterprise and T_5= Local seed.
In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMRT

Table 2. Main effect of vegetable crop seeds on seed quality

Treatments	Parameters		
	% Moisture	% Purity	% Germination
C_1	9.005c	75.20c	87.37a
C_2	9.962b	83.33a	60.53c
C_3	12.46a	78.93b	77.59b
LSD at 0.5	0.1084	1.335	1.767
CV %	1.39	2.25	3.14

Note: C_1= Radish, C_2= Country bean and C_3= Brinjal
In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMRT

Table 3**.** Combined effects of different sources and vegetable seeds crop (Radish, Country bean and Brinjal) on seed quality assessment

Treatments	Parameters		
	% Moisture	% Purity	% Germination
T_1C_1	14.06c	96.67a	98.17a
T_1C_2	6.367k	89.00b	73.00d
T_1C_3	14.02c	77.00d	78.00c
T_2C_1	6.897j	84.33c	87.67b
T_2C_2	9.367h	83.67c	39.33g
T_2C_3	12.76d	85.00c	81.00c
T_3C_1	7.133j	74.00d	91.00b
T_3C_2	9.300h	97.33a	27.67h
T_3C_3	10.08f	75.00d	70.67d
T_4C_1	7.633i	68.00e	82.00c
T_4C_2	10.47e	95.67a	96.67a
T_4C_3	9.823g	98.00a	97.63a
T_5C_1	9.300h	53.00g	78.00c
T_5C_2	14.31b	51.00g	66.00e
T_5C_3	15.61a	59.67f	60.67f
LSD at 0.5	0.2424	2.984	3.951
CV %	1.39	2.25	3.14

Note: T_1= Supreme Seed Company Ltd., T_2= Krishi banijjo protisthan, T_3= Metal agro limited, T_4= BRAC seed enterprise and T_5= Local seed, C_1= Radish, C_2= Country bean and C_3= Brinjal
In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMRT

Seedling evaluation test

The results on seedling evaluation test (shoot length, root length, fresh weight of shoot and root, dry weight of shoot and root, number of secondary roots/seedlings) of Radish, Country bean, and Brinjal showed significant differences among the sources, crops and in the combinations compared under laboratory conditions.

Effect of Sources

From the table (4), the results on seedling evaluation test such as shoot length showed significant differences among the sources. The longest shoot (17.62 cm) was found in the BRAC seed enterprise (T_4). On the contrary, the shortest shoot (10.98 cm) was found in Local seed (T_5). On the other hand, the longest root (14.44 cm) was found in Supreme Seed Company (T_1) and the shortest root (8.081 cm) was found in local seed (T_5). On the

other hand, root length was statistically similar among Krishi banijjo protisthan (T_2), Metal agro limited (T_3) BRAC seed enterprise (T_4). The maximum number of secondary root (5.44) was found in the sources of BRAC seed enterprise (T_4). On the contrary, the least number of Secondary root, (3.22) were found in Supreme seed (T_1). The number of secondary roots in Krishi banijjo protisthan (T_2) and Local were statistically identical. Further, the topmost fresh weight of shoot (10.71 mg) was found in the Supreme seed (T_1). On the contrary, the least fresh weight of shoots (9.52 mg) was found in Metal agro limited (T_3). On the other hand, the fresh weight of shoot was statistically different among Krishi banijjo protisthan (T_2), BRAC seed (T_2), Local (T_5). The highest fresh weight of root (3.96 mg) was found in the sources Supreme seed (T_1). On the contrary, the least fresh weight of root (2.51 mg) was found in Krishi banijjo protisthan (T_2). Finally, the highest amount of dry weight of shoot (0.81 mg) was found in the Supreme seed (T_1). On the contrary, the least amount of dry weight of shoot (0.31 mg) was found in local seed (T_5). The maximum amount of dry weight of root (0.42 mg) was found in the BRAC seed enterprise (T_4). On the contrary, the least dry weight of root (0.22 mg) was found in local seed (T_5).

Table 4. Main effect of different sources for Radish, Country bean and Brinjal to seedling evaluation test

Treatments	Parameters						
	Shoot length(cm)	Root length(cm)	Shoot fresh weight(mg)	Root fresh weight	Shoot dry weight(mg)	Root dry weight(mg)	No. of secondary roots/plant
T_1	14.47bc	14.44a	10.71a	3.96a	0.81a	0.38b	3.22c
T_2	15.32b	11.18b	9.78c	2.51d	0.54c	0.34c	3.33c
T_3	13.79c	10.62b	9.52c	2.63d	0.45d	0.30d	4.44b
T_4	17.62a	10.10b	10.40b	2.89c	0.70b	0.42a	5.44a
T_5	10.98d	8.081c	4.97d	3.55b	0.31e	0.22e	3.44c
LSD at 0.5	0.95	1.16	0.31	0.19	0.04	0.03	0.56
CV %	6.84	11.02	3.51	6.59	7.26	5.87	14.48

Note: T_1= Supreme Seed Company Ltd., T_2= Krishi banijjo protisthan, T_3= Metal agro limited, T_4= BRAC seed enterprise and T_5= Local seed.
In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMRT

Influence of vegetable crop seed on seedling evaluation test

From the table (5), the results on seedling evaluation test showed significant differences. The highest shoot length, root length, fresh weight of shoot, fresh of root, dry weight of shoot, dry weight of root, number of secondary roots /seedlings were obtained in C_2 (Country bean). Whereas minimum root length, fresh of root, dry weight of shoot, dry weight of root, number of secondary roots /seedlings were obtained in C_1 (Radish).

Table 5. Main effect of vegetable crop seeds to Radish, Country bean and Brinjal seedling evaluation test

Treatments	Parameters						
	Shoot length (cm)	Root length (cm)	Shoot fresh weight (mg)	Root fresh weight (mg)	Shoot dry weight (mg)	Root dry weight (mg)	No. of secondary roots plant^{-1}
C_1	12.24b	9.22c	3.67b	0.63c	0.12c	0.14c	2.53c
C_2	25.36a	13.08a	20.24a	6.99a	1.19a	0.66a	6.07a
C_3	5.71c	10.35b	3.32c	1.69b	0.37b	0.19b	3.33b
LSD at 0.5	0.74	0.89	0.24	0.15	0.03	0.02	0.43
CV %	6.84	11.02	3.51	6.59	7.26	5.87	14.48

Note: C_1= Radish, C_2= Country bean and C_3= Brinjal
In a column, figure bearing the same or no letter (S) do not differ significantly at 5% level of significant by DMRT

The combined effect of different sources and vegetable crop seed on seedling evaluation test

The combined effect of different sources and crops on shoot length was statistically significant (Table 6). The tallest shoot (30.73 cm) was found in the combination of BRAC Country bean seed (T_4C_2) while the shortest shoot (3.90 cm) was found in local Brinjal seed (T_5C_3). On the other hand, the tallest root (18.47 cm) was obtained in the combination of Supreme Country bean Seed (T_1C_2) while the shortest root (6.06 cm) was found in BRAC Radish seed (T_4C_1). The maximum number of secondary roots (8.33) was obtained in the combination of BRAC Country bean seed (T_4C_2) while the minimum number of secondary roots (1.33) was found in the combination of Supreme Seed Company Radish seed (T_1C_1). The maximum fresh weight of shoot (23.50 mg) was obtained in the combination of BRAC Country bean Seed (T_4C_2) while the minimum fresh weight of shoot (2.33 mg) was found in the combination of local Country bean seed (T_5C_3). The maximum fresh weight of root (9.35 mg) was obtained in the combination of Local Radish Seed Company (T_5C_1) while the minimum fresh weight of root (0.17 mg) was found in the combination of Local seed Country bean seed (T_5C_2). The maximum

dry weight of shoot (1.89 mg) was obtained in the combination of Supreme Country bean Seed (T_1C_2) while the minimum dry weight of shoot (0.07 mg) was found in the combination of BRAC Radish seed (T_4C_1). The maximum dry weight (0.87 mg) of roots was obtained in the combination of BRAC Country bean seed (T_4C_2) while the minimum dry weight (0.12 mg) of the root was found in local Radish seed (T_5C_1). The dry weight of root in the combination of Supreme Radish seed (T_1C_1) and Metal Radish seed (T_3C_1) was statistically identical.

Table 6. Combined effect of different sources and crop vegetable seeds (Radish, Country bean and Brinjal) to seedling evaluation text

	Parameters						
Treatments	**Shoot length (cm)**	**Root length (cm)**	**No of secondary root**	**Shoot fresh weight (mg)**	**Root fresh weight (mg)**	**Shoot dry weight (mg)**	**Root dry weight (mg)**
T_1C_1	14.22e	11.86bcde	1.33h	5.26e	1.30h	0.27g	0.17fg
T_1C_2	24.08c	18.47a	5.67b	23.24ab	8.75b	1.89a	0.78b
T_1C_3	5.100h	13.00bc	2.67efg	3.63gh	1.83fg	0.27g	0.21ef
T_2C_1	12.76ef	9.72efg	2.33fgh	3.50gh	0.67i	0.07h	0.14g
T_2C_2	28.87b	12.29bcd	4.33cd	22.94b	5.13e	1.09c	0.75b
T_2C_3	4.33h	11.53cdef	3.33def	2.90ij	1.73g	0.45f	0.14g
T_3C_1	12.46fg	10.56def	2.00gh	3.83g	0.60i	0.12h	0.15fg
T_3C_2	25.13c	11.32cdef	7.67a	21.32c	5.62d	0.68d	0.51c
T_3C_3	3.77h	9.99efg	3.67cde	3.40ghi	1.67g	0.55e	0.24e
T_4C_1	10.70g	6.07h	3.33def	3.17hi	0.43ij	0.07h	0.14g
T_4C_2	30.73a	14.00b	8.33a	23.50a	6.10c	1.60b	0.87a
T_4C_3	11.43fg	10.22def	4.67c	4.54f	2.13f	0.43f	0.25e
T_5C_1	11.04fg	7.91gh	3.67cde	2.60jk	0.167j	0.09h	0.12g
T_5C_2	18.00d	9.32fg	4.33cd	10.18d	9.35a	0.72d	0.42d
T_5C_3	3.90h	7.02h	2.33fgh	2.13k	1.13h	0.13h	0.12g
LSD at 0.5	1.65	2.01	0.96	0.53	0.34	0.07	0.05
CV %	6.84	11.02	14.48	3.51	6.59	7.26	5.87

Note: T_1= Supreme Seed Company Ltd., T_2= Krishi banijjo protisthan, T_3= Metal agro limited, T_4= BRAC seed enterprise and T_5= Local seed. C_1= Radish, C_2= Country bean and C_3= Brinjal

In a column, figure bearing same or no letter (S) do not differ significantly at 5% level of significant by DMR

DISCUSSION

The seed is a basic input in Agriculture. Seed quality is the possession of seed with required genetic and physical purity that is accompanied by physiological soundness and health status.The good quality seed has different characteristics. Seed moisture percent is one of them. High moisture percent in storage seed is not good for quality seed. For getting good quality seed, seed moisture should be controlled at their minimum level. Razzaque (1980) and Rahman *et al.* (1985) reported that the seeds absorbed moisture when they were stored in ordinary containers. In this experiment, the seeds from Metal Agro Limited had minimum moisture content whereas maximum moisture content was found in the seeds from local seed traders which may be due to the storage of seed without controlling relative humidity or they may be collected from the farmers.

Gurumitsingh and Harisingh (1992) reported that germination percentage differed significantly among the locations, source and variety of 39 samples of okra seed that ranged from 46 to 87%. In this work, the maximum purity and germination percentage were found in the seeds from Supreme Seed Company which might be proper content of seed moisture. On the other hand, the minimum purity and germination percentage were retained in the seeds from local seed traders.

Methods of evaluation of seed quality providing an accurate prediction of seed performance under field conditions are needed by the seed industry. In case of Seedling evaluation test, identical results were also experienced in another experiment where the highest radical and plumule lengths were recorded from the seed sample of Private Seed Company while the lowest from the seeds obtained from farmers (Parveen 2001). In the present study, the highest seedling vigour such as shoot length, root length, fresh weight of shoot and roots, dry weight of shoot and root, number of secondary roots were found in the Supreme seed which might be due to that those producers followed the rules of seed quality. On the other hand, minimum seedling vigour was found in the local seed.

It was stated that the maximum fresh weight of shoot, number of secondary roots and shoot length were in BRAC Country bean seed and dry weight of shoot and the longest root in Supreme Country bean seeds might be due to those processors probably follow the rule of seed quality. But the shortest shoot, shortest root, fresh

weight of shoot, dry weight of shoot and minimum dry weight of root were found in the local Brinjal seed which might be due to that those processors did not follow the rule of seed quality.

CONCLUSION

From the above-mentioned findings of the present study, it may be concluded that the highest percentage of quality seeds (based on moisture content, purity, germination, seedling vigour) were found from the seeds of BRAC seed enterprise than other seed companies and the lowest percentage were found from of local seeds. It was clear that seeds produced by local seed traders were inferior. Seeds produced by farmers are of inferior qualities as the seeds of local traders are not produced scientifically. The study also suggests that seed certification activities must be strengthened to have quality vegetable seeds in the markets. The local seed traders should also be trained up about the qualities of seeds and the factors, which affect seed qualities from production up to marketing.

REFERENCES

BBS (2017) Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics. Statistics Division, Ministry of Planning, Government of the Peoples Republic of Bangladesh, Dhaka. Pp. 28-393.

Cardoso MO, Oliveira AP, Pereira WE, Souza AP (2009) Eggplant growth as affected by cattle manure and magnesium thermophosphate in association with cow urine. Horticultura Brasileira 27: 307-313.

Corbineau F, Come D (2006) Priming: A technique for improving seed quality. Seed Testing International.132: 38-40.

Gill TB, Bates R, Bicksler A, Burnette R, Ricciardi V, Yoder L (2013) Strengthening informal seed systems to enhance food security in Southeast Asia. *Journal ofagriculture, food systems, and community development*. 3(3), 139-153.

Gomez KA, Gomez AA (1984) Statistical Procedure for Agricultural Research (2nd edn.) John Willey and Sons, New York. pp. 28-192.

Gurmitsingh, Harisingh (1992) Maintenance of germinability of soybean (*Glycine max* L.) seeds. Seed Research. 20: 49-50.

Khanom D (2011) Assessment of health and quality of some vegetable seeds of Mymensingh. M.Sc. Thesis, Department of Plant pathology, BAU, Mymensingh. p.28.

Mandol P (2013) Study of marketing system and shelf life extension of brinjal.Department of Horticulture. Bangladesh Agricultural University, Mymensingh. pp.1-3.

Parveen J (2001) Studies on the quality of some winter vegetable seed collected from different market source in Bangladesh. p. 96. pp.1-3.

Rahman MS, Hossain I, Mansur MA (1985) Effect of storage condition on the quality of wheat seed. *Bangladesh J. Agril. Sci*., 12(1), 49-54.

Razzaque MA (1980) Farm level storage of wheat seeds. Paper presented at the post-production workshop on food grains, December 12-14. Workshop sponsored by the Food Sci. and Tech. Div. BCSIR with financial assistance from the Ford Foundation, Dhaka.

Singh BD (2011) Plant Breeding: Principles and Methods. 4thIssue. Kalyani Publisher, Ludhiana, Punjab. pp. 916.

Sultana N (2001) Genetic variation of morphology and molecular markers and its application to breeding in Lablab bean. A Ph. D Thesis, Kyshu University, Fukuoka, Japan.143p.Testing International.132: 38-40.

Ventura L, Donà M, Macovei A, Carbonera D, Buttafava A, Mondoni A, Rossi G, Balestrazzi A (2012) Understanding the molecular pathways associated with seed vigor. Plant Physiology and Biochemistry. 60: 196-206.