Journal of Spices and Aromatic Crops
Vol. 22 (2) : 233–237 (2013)
www.indianspicesociety.in/josac/index.php/josac

Indian Society for Spices

Assessment of seed quality in seed spices

C K Pramila, K P R Prasanna*, P Balakrishna, P J Devaraju & Siddaraju

Department of Seed Science and Technology
University of Agricultural Sciences, GKVK, Bengaluru, Karnataka, India.
**E-mail: prasannaseed@gmail.com*

Received 30 March 2012; Revised 10 September 2012; Accepted 4 February 2013

Abstract

The present study was carried out to assess seed quality of some important seed spices supplied in the local markets of Bengaluru. The results revealed that highest physical purity was recorded in fenugreek seed lots with an overall mean of 98.76% followed by fennel (97.99%) and coriander (97.68%). The moisture content of all the seed spices ranged from 6.89% to 7.15%. The highest seed germination (89.42%) was recorded in fenugreek followed by fennel (76.82%) and lowest (64.33%) in coriander. The seedling vigour index was highest in fenugreek (range 1116-1819; mean 1532) and lowest in cumin (range 621-832; mean 737). A 12.0% increase in germination and improvement in the vigour index (997-1226) were also noticed in treated seed samples compared to control (900).

Keywords: fungicides, seed quality, seed spices

Major seed spices *viz*., cumin, coriander, fennel, fenugreek and minor seed spices *viz*., dill, nigella, ajowain, anise, celery, caraway, poppy seeds together contributes 36% share in area and 17% share in production of total spices in India. The major seed spices like cumin, coriander, fennel and fenugreek cover an area of 765497 ha (49020 ha, 40350 ha, 43466 ha and 32661 ha, respectively), with a production of 479110 t (158350 t, 223400 t, 61652 t and 35708 t, respectively) and productivity of 3621 kg ha^{-1} (454, 656, 1418 and 1093 kg ha^{-1}, respectively). During 2008–09, India earned Rs. 5440 m by exporting 52,550 t of seed spices to various countries. The world demand is poised to increase ten times in the next five years and this presents an excellent commercial opportunity for the country (Anon 2012).

Seed replacement ratio of seed spices is very low due to non availability of quality seed. There is hardly any organized seed production programme for the supply of quality seed and planting materials of seed spices. Loose/ bulk seeds of these crops are sold in the local shops without labels in most cases and seed production programme in these crops are yet to be standardized to produce quality seeds (except for fenugreek) and also marketing and distribution of quality seeds of these spice seeds are yet to be organized. As a result the farmers depend on local markets to meet their seed requirements. Hence, an attempt was made to study the seed quality parameters of major seed spices like fenugreek, coriander, cumin and fennel supplied in the local market of Bengaluru district.

Laboratory studies were carried during 2009–10 at the Department of Seed Science and Technology, University of Agricultural Sciences, Bengaluru with an objective to evaluate the seed quality parameters of different seeds spices procured from the local seed markets. Primary samples of fenugreek (9 lots), coriander ((9 lots), fennel (4 lots) and cumin (4 lots) in equal size were taken at random from seed dealers of Bengaluru district. Then the seeds were combined and blended for homogeneity to form a composite sample. The working sample was obtained from the composite sample and subjected to seed quality analysis as per ASTA rules.

Germination test was conducted by placing 100 seeds in four replicates and placed in sterile glass petridishes of 18 cm diameter containing three wet blotter papers. Then the petridishes were incubated at 25±1°C for 14 days. Observations on normal seedlings, shoot length, seedling dry weight and vigour index were recorded on 7th day as first count and 14th day as final count. The other seed quality parameters *viz*., electrical conductivity (dSm^{-1}), mean seedling length (cm) and mean seedling dry weight (mg) were recorded as prescribed by Anon (2007). Seedling vigour index was calculated by using seedling growth parameters and expressed as a whole number as suggested by Abdul-Baki & Anderson (1973). Further, to study the efficacy of seed treatment chemicals on seed quality parameters, one popular variety of that region (TFL) from each crop was treated with fungicides like bavistin and captan @ 2 g kg^{-1} seed and untreated seed samples were kept as control. The seeds were then evaluated for quality parameters. Data obtained were statistically analyzed by using suitable ANOVA and critical differences between the treatments were worked out at 1% significance as per Snedecor & Cochran (1967).

Low income farmers in developing countries rely heavily on informal channels like on-farm seed saving, farmer-to-farmer exchanges, local markets and unregulated sales for access to seeds. Typically these transactions do not involve quality seeds resulting in poor establishment of the crop and low production. Evaluation of seed quality is an integral part of seed improvement programme. In most of the cases, performance of the seed relates to its ability to germinate and produce a healthy vigorous plant. In case of seed spices, there is hardly any organized seed production programme for the supply of quality seed and planting materials that are truthfully labeled.

The results revealed that among the seed spices tested, highest physical purity (94.94%-99.50%) was recorded in fenugreek seed lots ranged from 94.94%-99.50% (Fig 1) with an overall mean of 98.76% followed by fennel (range 95.52%-99.42%; mean 97.99%) and by coriander (range 95.90%-99.34%; mean 97.68%). All the seed samples tested were free from other crop seeds and weed seeds except one coriander seed lot which had severe insect infestation with drug store beetle (*Stegobium panacium*). The moisture content of all the seed spices was in the range of 6.70% to 7.43% (Fig 2), which was in the safe range and also due to differential response of these crops to the environmental conditions (Suresh 2008).

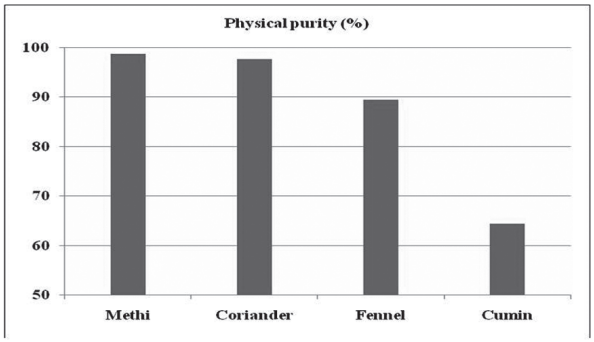

Fig 1. Physical purity of seed spices collected from local markets of Bengaluru

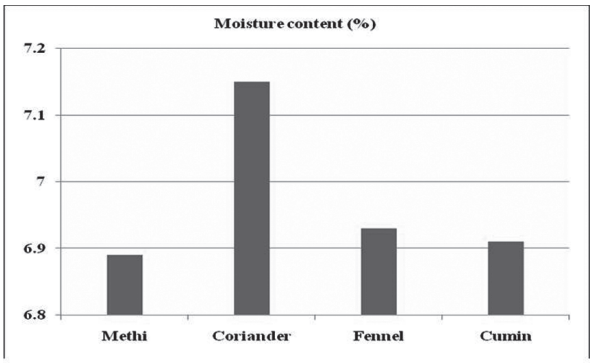

Fig 2. Moisture content of seed spices collected from local markets of Bengaluru

In general, the seed lots with higher test weight are found to be superior in quality in terms of higher germination and seedling vigour (Jacobson & Globerson 1980). In the present study, 100 seed weight ranged from 1.21 g to 1.95 g with an average of 1.65 g in methi, whereas in coriander it ranged from 0.80 g to 1.33 g with a mean of 1.04 g (Table 1). However, in fennel it varied from 0.75 g to 1.03 g with a mean of 0.86 g. Similar results were also reported by Lokesh (2002) among different seed lots of onion. The most important attribute which represents seed quality is germination percentage. It ranged from 78.0% to 85.5% with a mean of 89.42% in methi followed by fennel (range 68.10%-84.11%; mean 76.82%) (Table 2). The significant difference observed for germination percentage between the crops, could be attributed to the differences in the stage of seed deterioration. The coriander seed lots recorded slightly lower seed germination, ranging from 57% to 72% with a mean of 64.33%. However, cumin seed samples recorded the lowest germination ranging from 55.12% to 69.12% with an average of 62.12% (Table 3). In coriander, split seeds recorded slightly lower germination, whereas cumin and fennel seeds produced multigerm seedlings.

In fenugreek, seedling length varied from 13.05 cm to 18.85 cm with overall mean of 17.09 cm. In coriander, the seedling length varied from

Table 1. Assessment of seed quality parameters in fenugreek and coriander

Seed lots	Physical purity (%)		Moisture content (%)		100 seed weight (g)	
	Fenugreek	Coriander	Fenugreek	Coriander	Fenugreek	Coriander
L_1	99.50	99.34	6.82	6.95	1.21	1.15
L_2	98.99	99.34	6.90	6.87	1.75	1.33
L_3	99.38	96.94	6.93	7.32	1.65	1.14
L_4	99.50	95.90	6.74	7.42	1.95	0.98
L_5	99.20	97.08	6.94	7.44	1.57	1.04
L_6	98.80	97.05	6.73	6.98	1.76	0.91
L_7	99.05	97.74	6.73	7.05	1.68	1.11
L_8	94.94	99.38	7.39	6.91	1.67	0.94
L_9	99.50	96.35	6.84	7.43	1.58	0.80
Mean	98.76	97.68	6.89	7.15	1.65	1.04
SEm ±	0.49	0.45	0.07	0.08	0.07	0.05
CD (P=0.01)	2.60	2.29	0.12	0.09	0.09	0.08
CV (%)	0.81	0.72	0.57	0.39	1.64	2.64

Table 2. Assessment of seed quality parameters in fenugreek and coriander

Seed lots	Germination (%)		Seedling length (cm)		Seedling vigour index	
	Fenugreek	Coriander	Fenugreek	Coriander	Fenugreek	Coriander
L_1	92.00	64.00	17.43	12.14	1604	777
L_2	78.00	71.00	17.30	13.46	1350	956
L_3	92.00	59.00	17.25	11.46	1586	676
L_4	92.50	57.00	18.21	11.92	1684	679
L_5	85.50	60.00	17.34	12.35	1483	741
L_6	96.50	64.00	18.85	12.67	1819	811
L_7	90.25	69.00	16.95	13.08	1530	903
L_8	85.50	72.00	13.05	12.94	1116	932
L_9	92.50	63.00	17.45	11.94	1614	752
Mean	89.42	64.33	17.09	12.44	1532	803
SEm ±	1.84	1.78	0.54	0.22	67.64	35.02
CD (P=0.01)	3.69	4.59	0.36	0.79	69.72	91.37
CV (%)	1.27	2.21	0.66	1.96	1.40	3.5

Table 3. Assessment of seed quality parameters in fennel and cumin

Seed lots	Seed quality parameters in fennel					
	Physical purity (%)	Moisture content (%)	100 seed weight (g)	Germination (%)	Seedling length (cm)	Vigour index
L_1	99.42	6.79	0.89	80.05	12.67	1014
L_2	99.16	6.72	1.03	84.11	13.09	1101
L_3	95.52	7.29	0.75	68.10	11.02	750
L_4	97.85	6.94	0.79	75.00	12.10	907
Mean	97.99	6.93	0.86	76.82	12.22	943
SEm ±	0.89	0.13	0.06	3.45	0.45	75.42
CD (P=0.01)	3.25	0.31	0.02	0.51	0.06	4.88
CV (%)	0.72	0.12	0.58	0.14	0.12	0.11
	Seed quality parameters in cumin					
L1	97.72	6.97	0.41	56.05	11.09	621
L2	98.74	6.70	0.44	68.20	12.20	832
L3	95.52	7.29	0.42	55.12	12.10	667
L4	97.32	6.68	0.40	69.12	11.97	827
Mean	97.33	6.91	0.42	62.12	11.84	737
SEm ±	0.67	0.14	0.01	3.78	0.26	54.34
CD (P=0.01)	NS	0.06	0.01	0.86	0.32	25.27
CV (%)	1.92	0.21	0.34	0.31	0.61	0.75

11.46 cm to 13.46 cm with an average of 12.44 cm. In fennel, the seedling length ranged from 11.02 cm to 13.09 cm with an overall mean of 12.22 cm and in cumin, it ranged from 11.09 cm to 12.20 cm with a mean of 11.84 cm. The seedling vigour index was highest in fenugreek (range 1116-1819; mean 1532) and lowest seedling vigour index was recorded in cumin (range 621-832; mean 737). However, in coriander it ranged from 676 to 956 with a mean of 803. In fennel, it ranged from 750 to 1101 with a mean of 943. The difference in seedling characters may be due to the inherent genotypic variations and also due to the differential response to the environmental conditions. Similar results were reported by Grover & Bansal (1968) in capsicum seeds collected from local markets of Bengaluru.

The fungicidal treatment with proper dosage and treatment methods were found to preserve the quality of seeds by their well known anti-fungal effect, since the degradation of seed lipids by fungi and concomitant increase in the free fatty acids of seeds with storage fungi are definitely associated with seed deterioration (Prasanna 1994). Seed treatment remains the best and cheapest method to control seed borne diseases, avoid seed rots and seedling blight caused due to seed borne infection and improves seed germination. The results of the present study revealed that seeds dressed with fungicides recorded higher germination in all crops compared to untreated control (Table 4). Among the fungicides treated, there was 12% increase in germination in seed treatment with captan @ 2g kg^{-1}. In all the seed spices it was found superior (81.47%) over bavistin (74.57%) and control (68.70%). The vigour index also improved in fungicide treated seed samples (997-1226) compared to control (900) (Fig. 3). Seed treatment with fungicides improved the germination percentage since these fungicides act as protectants against the growth and development of storage fungi. Similar findings were reported by Vijayakumar *et al.* (1991) in onion.

The seed samples collected from different seed selling points, farmers and seed dealers,

Table 4. Seed quality as influenced by seed treatment in seed spices

Crops	Germination (%)			Seedling length (cm)			Seedling vigour index		
	Bavistin (2 g kg^{-1})	Captan (2 g kg^{-1})	Control	Bavistin (2 g kg^{-1})	Captan (2 g kg^{-1})	Control	Bavistin (2 g kg^{-1})	Captan (2 g kg^{-1})	Control
Fenugreek	85.21	91.36	83	15.46	17.31	15.91	1317	1581	1321
Coriander	66.95	76.36	58.8	12.68	14.46	12.1	849	1104	712
Fennel	81.82	86.56	73.8	12.76	14.3	11.87	1044	1238	876
Cumin	64.31	71.58	59.2	12.11	13.68	11.71	779	979	693
Mean	74.57	81.47	68.70	13.25	14.94	12.90	997	1226	900
SEm ±	5.24	4.54	5.91	0.75	0.81	1.01	120.54	129.82	145.95
CD (P=0.01)	5.63	3.25	3.25	0.93	4.31	0.28	76.2	85.3	62.9
CV (%)	1.64	0.87	1.03	1.53	NS	0.48	1.66	1.82	1.53

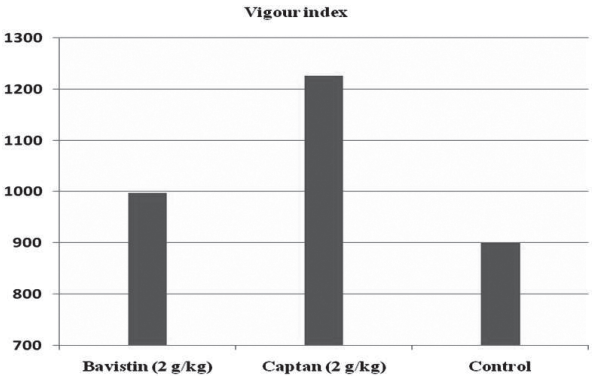

Fig 3. Seedling vigour index as influenced by seed treatment in seed spices

recorded physical purity above the required seed certification standards. However, variation in 100 seed weight and seed germination was noticed particularly in coriander, fennel and cumin. This may be due to variation in the seed samples and pre- and post-harvest handling. Since there are minimum standards available in only one crop i.e., fenugreek, which recorded maximum germination per cent as well as physical purity compared to other samples tested. The fungicidal seed treatment improved the seed quality parameters of seed spices.

References

Abdul-Baki A A & Anderson J D 1973 Vigour determination in soybean seeds by multiple criteria. Crop Sci. 13: 630–633.

Anonymous 2007 International Rules for Seed Testing. Seed Sci. & Technol. 24: 23–46.

Anonymous 2012 Vision 2030, National Research Centre on Seed Spices. ICAR, Tabiji, Ajmer, Rajasthan, India.

Grover R K & Bansal R D 1968 Occurrence and over wintering of *Colletotrichum piperaturn* on *Capsicum frutescens* in India. Indian Phytopath. 21: 116–118.

Jacobson R & Globerson D 1980 Carrot seed quality in seed production. Hibblethwaite (Eds.) Butterworths Publication, pp.637–646.

Lokesh K 2002 Investigation on floral initiation and seed production behavior in onion (*Allium Cepa* L.) genotypes. Ph.D Thesis, University of Agricultural Sciences, Bengaluru.

Prasanna K P R 1994 Storage conditions for seed health. Abstract paper of IX All India Seed Seminar, 7–9 December. Seed Tech. News 24: 71.

Snedecor G W & Cochran W G 1967 Statistical methods. The Iowa State University Press, USA, pp.593.

Suresha H V 2008 Studies on seed quality and storability in some vegetable crops. M.Sc (Ag.) Thesis, University of Agricultural Sciences, Bengaluru.

Vijayakumar A, Palanisamy V, Jayaraj T & Arumugam R 1991 Effect of seed treatments and containers on the storability of onion seed. South Ind. Hort. 39: 296–299.