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Vijay Kumar
Assistant Agriculture Office, State Department of Agriculture, Uttarakhand, India

Sunita Bhandari
Department of Agriculture, U.C.B.M.S. & H, Dehradun, Uttarakhand, India

AC Mishra
Associate Professor, Department of Horticulture, Banda Agriculture University, Uttar Pradesh, India

Correspondence
Vijay Kumar
Assistant Agriculture Office, State Department of Agriculture, Uttarakhand, India

Evaluation of Chilli (*Capsicum annuum* L.) Genotypes for Seed Quality parameters

Vijay Kumar, Sunita Bhandari and AC Mishra

Abstract
The present investigation was conducted during *Kharif* 2014 at vegetable laboratory of Veer Chandra Singh Garhwali Uttarakhand University of Horticulture and Forestry, Ranichauri Campus with 14 genotypes of chilli. The experiment was laid out in randomized block design with three replications. Observation were recorded on different seed quality characters *viz*., 1000 seed weight, standard germination (%), radical length (cm) plumule length (cm), seedling length (cm), 10 seedlings' fresh weight (g), 10 seedlings' dry weight (g), seedling vigour index-I and seedling vigour Index-II. A great extent of variability was observed among the various genotypes for characters studied.
Analysis of variance for seed yield and quality characters revealed significant difference among the genotypes for all the characters. The genotype UHFC 12-5 was promising for radical length (5.11 cm), plumule length (5.27 cm), seedling length (10.38 cm) and seedling vigour index-I (671.07). Maximum value for 10 seedlings' fresh weight (0.29 g) and seedling vigour index-II (18.69) was noted in UHFC 12-1.

Keywords: Variability, seed viability and vigour parameters, chilli genotypes

Introduction
Chilli is an often cross pollinated crop and, therefore, exhibits wide variability for different qualitative and quantitative traits (Tanksley, 1984) [19]. There are five cultivated species of peppers including *Capsicum annuum C. frutescens, C. chinense C. pubescens* and *C. Baccatum (*Heiser and Smith, 1957) [7]. The chilli has become an important commercial crop of India as it is profusely consumed as green as well as powder of red ripe fruits (Anonymous, 2011) [2].
Chilli is grown as perennial shrub in suitable climatic conditions. The *C. annuum* L. is most widely cultivated for its pungent fruits throughout the world. (Bosland and Votava, 2000) [3]. It is grown in both tropical and subtropical areas ranging from sea level to 2000 meter altitude in Indian conditions (Joshi and Singh, 1975) [9]. It is found to be grown successfully as a rainfed crop in area receiving an annual rainfall of 850-1200 mm. In general, a frost free period of four month with maximum temperature ranging from 20 -30^{0}C and minimum not below 15^{0}C is ideal for plant development (Rylski, 1972) [17].
Chillies are rich in vitamins, especially in vitamin A and C. They are also packed with potassium, magnesium and iron. Chilli have long been used for pain relief as they are known to inhibit pain messengers, extracts of chilli peppers are used for alleviating the pain of arthritis, headaches, burns and neuralgia. It is also claimed that they have the power to boost immune system and lower cholesterol (Rajendra and Saxena 2009) [15].
Variability among the genotype can also be assessed on account of seed quality parameters. A genotype performing better for seed yield in a particular agroclimate indicates its better adaptability to that particular agroclimate conditions and designing breeding programme involving that well adapted genotype may lead to convergence of desirable genes to progeny. Variability in seed quality parameters like seed boldness, germinability, seedling vigour etc. may also lead to useful conclusions. An aggregate account of seed yield and quality indicates may prove to be informative for initializing a breeding programme to evolve population with ability to produce more quantity of vigorous seeds.
The information on studies on quality parameters in chilli genotypes is available in the temperate region. Poor adaptability to sub optimal low temperature in rain fed condition at high altitude and lack of promising high yielding cultivar are major constraints for bringing up chilli cultivation in hill region of Uttarakhand at commercial scale.
Collection of evaluation of germplasm for adaptability to suboptimal low temperature, moisture stress and excessive rainfall condition in relation to seedling ability and seed quality raits may offer like Uttarakhand hills. The present investigation, therefore include following objective.

Materials and methods

The present investigation entitled "Evaluation of Chilli (*Capsicum annuum* L.) Genotypes for Seed Quality parameters" was carried out during the *kharif* season of 2014 at Vegetable laboratory Block of Department of Vegetable Science, Veer Chandra Singh Garhwali Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri Garhwal, Uttarakhand. The experiment was conducted in the Complete Randomized Design (C.R.D.) with three replication during *kharif* season of 2014. These genotypes were further utilized under laboratory experiment to predict the quality of the seeds. For determination of performance of 1000 seed weight, standard germination (%), radical length (cm) plumule length (cm), seedling length (cm), 10 seedlings' fresh weight (g), 10 seedlings' dry weight (g), seedling vigour index-I and seedling vigour Index-II. The data collected on different quantitative and qualitative traits were processed for the analysis of variance as per suggested the procedure by Panse and Sukhatme (1967) [12]. The table for analysis of variance (ANOVA) was set as explained by Gomez and Gomez (1983) [16].

Results and Discussion

Variability for Seed Quality Parameters

1. 1000- seed weight (g)

The 1000 seed weights of 14 genotypes were recorded after harvesting of red ripe fruits and extraction of seeds. It was observed that there was significant difference among the genotypes which ranged from 4.06 g - 6.30 g. The maximum 1000- seed weight was observed in UHFC 13-4 (6.30 g) which was statistically *at par* with all the genotypes UHFC 12-4 (6.03 g), Pusa Jwala (5.93 g), Pusa Sadabahar (5.73 g), Kashmiri Long (5.60 g), UHFC 13-2 (5.60 g), UHFC 13-7 (5.56 g), UHFC 12-1 (5.53 g) and UHFC 12-2 (5.43 g). The minimum value was recorded for UHFC 12-5 (4.06 g). The population mean for this trait was observed to be (5.35 g). The 1000 seed weight is the trait indicating comparative boldness and level of viable seeds in the random samples. The genotypes with higher 1000 seed weight are likely to have bolder and well- filled seeds with more viability as compared to those with lower 1000 seed weights. Similar results on variability in 1000 seed weight have also been reported by Smith and Basvaraja (2006) [18] from 1.91 g to 6.11 g, Ravihunje *et al*. (2007) [16] from 4.94 g to 5.71 g, Pandit and Adhikary (2014) [14] from 3.46 g to 6.80 g and Amit *et al*. (2014) [1] from 2.05 g to 5.28 g 1000 seed weight in chilli.

2. Standard germination (%)

The mean standard germination ranged from 56.00% to 75.67% across the genotypes with significant difference (Table 4.1.2). The maximum standard germination was observed in the case of UHFC 13-2 (75.67%) followed by UHFC 12-2 (69.67%) and UHFC 12-3 (67.33%) whereas the minimum standard germination was recorded in Pusa Jwala (56.00%). The population mean for this character was 64.62%.

The germination percentage happens to be one of the most important characteristics of seed to be commercially used. Germination seems to be a biological process depending on several factors including the differential behaviour of genotypes. Standard germination is related to the level of viability of seeds lot in a particular genotype. Differential response of the seed lot of the genotypes to standard germination might be due variable genetic makeup of the genotypes. The findings of present investigation on standard germination could be compared with reports of earlier workes *viz.*, Natesh *et al*. (2005) [11] (78.36% - 81.27%), Ravihunje *et al*. (2007) [16] (83.00% - 87.31% maximum in oven dried at 35^0C and minimum value in shad drying), Christinal and Tholkkappian (2012) [4] (71.38% - 82.80%) and Priya *et al*. (2013) [13] (87.13% - 87.32%) in chilli.

3. Radical length (cm)

Seedling radical length showed significant differences across the genotypes with a range of 3.06 cm to 5.11 cm (Table 4.1.2). The highest value of radical length was observed in UHFC 12-5 (5.11 cm) which was significantly superior to all other genotypes. The other genotypes with higher radical length were UHFC 12-2 (4.75 cm) and UHFC 13-7 (4.72 cm). The lowest value for this character was measured in UHFC 13-4 (3.06 cm). The overall mean for radical length of various genotypes was 4.12 cm. The radical length is associate with ability of seedlings to establish in moisture and nutrient rich zone of soil. Therefore, this trait may be linked with stress tolerance ability of genotypes. Higher radical length indicating more tolerance in the genotypes to moisture stress. Different genotypes of chilli showed high variability for seedling radical length. Corresponding results on variability in radical length have also been reported by Dhanelappagol *et al*. (1994) [5] from 7.88 cm to 10.18 cm, Ravihunje *et al*. (2007) [16] from 5.86 cm to 8.76 cm, Manjunath *et al*. (2009) [10] up to 7.85 cm and Christinal and Tholkkappian (2012) [4] from 6.45 cm to 8.45 cm in chilli.

4. Plumule length (cm)

The plumule length ranged from 3.83 cm to 5.27 cm with significant difference across the genotypes (Table 4.1.2). The genotype UHFC 12-5 recorded maximum plumule length (5.27 cm) followed by UHFC 13-3 (5.05 cm) which were statistically *at par*. The other genotypes with higher plumule length were UHFC 13-1 (4.91 cm), Pusa Jwala (4.90 cm) and UHFC 13-7 (4.87 cm). The general mean of population for this trait was 4.49 cm. Minimum value for plumule length was observed in Kashmiri Long (3.83 cm). Plumule length is an index of seed vigour which may contribute towards better growth and development of seedlings. Comparable range of variability for shoot/ plumule length in chilli have also been reported by Dhanelappagol *et al*. (1994) [5] from 7.88 cm to 8.77 cm, Ravihunje *et al*. (2007) [16] from 6.46 cm to 7.85 cm and Christinal and Tholkkappian (2012) [4] from 6.88 cm to 8.36 cm.

5. Seedling length (cm)

The seedling length is associated with earliness of the genotypes in respect of emergence, plant growth potential and probably also for earliness in fruiting. In this investigation the genotypes exhibited a wide range of seedling length (7.53 cm to 10.387 cm) with significant differences. The maximum and significantly higher seedling length was observed for UHFC 12-5 (10.38 cm) followed by UHFC 13-7 (9.59 cm), UHFC 12-2 (8.99 cm), Pusa Jwala (8.98 cm) and UUHF 12-6 (8.97 cm). The minimum value of seedling length was noted in UHFC 13-4 (7.53 cm). The population mean for this trait was 8.71 cm (Table 4.1.2). Variability in seedling length of chilli for different genotypes have also been reported by Vallego *et al.* (1999)

6. Seedlings' fresh weight (g)

There were significant differences among the fourteen genotypes of chilli for seedlings' fresh weight which varied

significantly from 0.35 g to 0.47 g. The largest value was observed in UHFC 12-6 (0.47 g) followed by UHFC 12-2 and UHFC 12-4 (0.46 g) and Kashmiri Long (0.45 g) and UHFC 13-1 (0.43 g) with *at par* value. The lowest value was noted UHFC 12-3 (0.35 g) and population mean was observed to be 0.41 g. Seedlings' fresh weight is function of seedling length. With increase in length of a seedling this resumed a sharp rise in fresh weight. Variation in seedling radical and plumule length of genotypes not only affected the overall vigour but also possessed a proportional relationship with the fresh weight of seedlings. The findings of present investigation could be correlated with that of Jolly and Ekbote (2005) [8] who reported a range of fresh weight from 19 mg to 25 mg in chilli.

7. Seedlings' dry weight (g)

The value of 10 seedlings' dry weight ranged from 0.15 g to 0.29 g. The maximum 10 seedlings' dry weight was observed in UHFC 12-1 (0.29 g) which was statically *at par* with that in UHFC 13-3 (0.26 g), Kashmiri Long (0.26 g), UHFC 12-2 (0.25 g) and UHFC 12-6 (0.24 g). The minimum value for 10 seedlings' dry weight was recorded in UHFC 12-5 (0.15 g) whereas the general mean of population was found to be (0.22 g) Table (4.1.2). There was a parallelism between 10 seedlings' dry weight and 10 seedlings' fresh weight indicating presence of seedling vigour due accumulation of dry matter in plant tissues. Variability in seedling dry weight of chilli genotypes has also been reported by Natesh *et al*. (2005) [11] from 3.57 mg to 4.01 mg, Ravihunje *et al*. (2007) [16] from 16.70 mg to 19.70 mg and Christinal and Tholkkappian (2012) [4] from 14.50 mg to 18.40 mg.

8. Seedling vigour index- I

The mean performance of the genotypes for seedling vigour index-I varied significantly and ranged from 446.55 to 671.07. The highest value vigour index-I was observed in UHFC 12-5 (671.07) followed by UHFC 13-2 (639.08) with statistically *at par* values. The genotypes UHFC 12-2 (625.92) and UHFC 13-7 (607.36) were other genotypes with comparatively higher vigour index-I value. The minimum value of vigour index-I was recorded in UHFC 13-4 (446.55). The population mean for this trait was 562.26. Germination percentage and seedling length were the majors factor for deciding the vigour index-I. Variability in seedling vigour index-I in chilli genotypes have also been studied by Dhanelappagol *et al*. (1994) [5] who reported a wider range of variability from 248.38 to 1735.18 however and Natesh *et al*. (2005) [11] from 743 to 901 in chilli.

9. Seedling vigour index- II

All fourteen genotypes of chilli showed significant and wide range of variability seedling vigour index-II form 10.11-18.69. The highest value of seedling vigour index-II was recorded in UHFC 12-1 (18.69) followed by statistically *at par* values in UHFC 12-2(17.60), Kashmiri Long (17.05), UHFC 13-3 (16.87), UHFC 13-1 (15.13) and UHFC 12-4 (15.11). The lowest value was observed in UHFC 12-5 (10.11) and overall mean of population for this character was 14.42. Seedling vigour index-II is helpful in monitoring and ensuring the survival and growth of seedlings after germination. This character showed significant variation, which might be due to genetic constitution of the genotypes. Corresponding results on variability in seedling vigour index-II in chilli genotypes have also been reported by Ravihunje *et al*. (2007) [16] from 10.05 to 14.94 and Priya *et al*. (2013) [13] from 14.89 to 15.13 from the above results, it was evident that the genotypes included in this study varied significantly for various seed quality characters. The genotype UHFC 12-5 registered maximum values for radical length (5.11 cm), plumule length (5.27 cm), seedling length (10.38 cm) and seedling vigour index-I (671.07) whereas UHFC 12-1 exhibited highest values for seedling fresh weight (0.47g), seedling dry weight (0.29 g) and seedling vigour index-II (18.69). Maximum standard germination was noted in seeds of UHFC 13-2 (75.67%). The genotype UHFC 13-4 was promising from 1000 seed weight (6.30 g).Therefore, UHFC 12-5, UHFC 12-1, UHFC 13-2 and UHFC 13-4 would be utilized for improvement of most of the seed quality parameters in chilli.

Table.1 Mean performance of different Chilli genotypes for various quality parameters.

S. No.	Character Genotype	1000 seed weight (g)	Standard germination (%)	Radicle length (cm)	Plumule length (cm)	Seedling length (cm)	10 seedlings' fresh weight (g)	10 seedlings' dry weight (g)	Seedling vigour index I	Seedling vigour index II
1	UHFC 12-1	5.53	64.67	4.49	4.18	8.67	0.47	0.29	560.84	18.69
2	UHFC 12-2	5.43	69.67	4.75	4.24	8.99	0.46	0.25	625.92	17.60
3	UHFC 12-3	4.07	67.33	4.00	4.51	8.52	0.35	0.20	573.03	13.63
4	UHFC 12-4	6.03	65.00	3.99	4.61	8.61	0.46	0.23	559.14	15.11
5	UHFC 12-5	4.06	64.67	5.11	5.27	10.38	0.38	0.15	671.07	10.11
6	Kashmiri Long	5.60	66.33	3.98	3.83	7.82	0.45	0.26	518.32	17.05
7	UHFC 13-2	5.60	75.67	3.77	4.68	8.45	0.36	0.19	639.08	14.39
8	UHFC 13-3	4.73	65.67	3.63	5.05	8.68	0.41	0.26	570.04	16.87
9	UHFC 13-4	6.30	59.33	3.06	4.47	7.53	0.40	0.20	446.55	11.86
10	Pusa Jwala	5.93	56.00	4.08	4.90	8.98	0.39	0.22	502.74	12.11
11	Pusa Sadabahar	5.73	63.67	4.12	3.97	8.09	0.41	0.22	514.74	13.91
12	UHFC 12-6	5.10	59.00	4.25	4.71	8.97	0.47	0.24	529.01	14.00
13	UHFC 13-1	5.33	64.33	3.70	4.91	8.61	0.43	0.23	553.76	15.13
14	UHFC13-7	5.56	63.33	4.72	4.87	9.59	0.38	0.18	607.36	11.47
	Mean	5.35	64.62	4.12	4.59	8.71	0.41	0.22	562.26	14.42
	C.V	10.44	4.21	2.80	3.16	2.21	6.26	14.20	3.77	16.13
	S.e.m	0.32	1.57	0.07	0.08	0.11	0.01	0.02	12.24	1.34
	C.D. 5%	0.93	4.55	0.19	0.24	0.32	0.04	0.05	35.47	3.89

CD= critical deference, CV=Critical Variance, Sem= standard mean error

Conclusion

From the results of the present investigation it could be concluded that out of fourteen genotypes of chilli the genotype UHFC 12-5 was promising for radicle length (5.11 cm), plumule length (5.27 cm), seedling length (10.38 cm) and seedling vigour index-I (671.07). Maximum value for 10 seedlings' fresh weight (0.29 g) and seedling vigour index-II (18.69) was noted in UHFC 12-1. Therefore, genotypes

UHFC 12-6, UHFC 12-4, UHFC 12-5 and UHFC 12-1 could be used in future breeding programme for improvement in most of the ripe fruit yield, seed yield, and seed quality parameters in chilli.

References

1. Amit K, Ahad I, Kumar V, Thakur S**.** Genetic variability and correlation studies for growth and yield characters in chilli (*Capsicum annuum* L.). J Spice and Aromatic Crops. 2014; 23(2):170-177.
2. Anonymous**.** World spice congress, New Delhi, 2011. www.spiceboard.org. 12-10-2014.
3. Bosland PW, Votava EJ. Pepper vegetable and spice capsicum crop production science in horticulture. CABI Publishing Wallingford. U.K. 2000; 12:204.
4. Christinal V, Tholkkappian P. Seed quality in chilli influenced by the different types of drying method. International J Recent Scientific Res. 2012; 3(9):766-770. Dhanelappagol MS, Shashidhara SD, Kulkarni GN. Effect of stages of harvesting and method of drying of chilli fruit on seed quality. Karnatka J Agric. Sci. 1994; 7(1):36-39.
5. Gomez KA, Gomez AA. Statistical Procedure for Agriculture Research. 2nd edition. John Wiley and Sons, New York. 1983, 357-427.
6. Heiser JR, Smith CB. Taxonomy of capsicum sinense Jacq. and the geographical distribution of the cultivated Capsicum species. Bull Torry Bot Club. 1957; 84:413-420.
7. Jolly RB, Ekbote SD. Influence of fruit maturity and post- harvest ripening on Seed quality of chilli. Karnataka J Agric. Sci. 2005; 18(3):811-813.
8. Joshi MC, Singh DP. Chemical composition in bell peppe r. Indian Horti.Sci. 1975; 20:19-21.
9. Manjunath SN, Deshpande VK, Sridevi O, Uppar DS, Babalad HB, Rao MSL. Influence of seed pelleting on crop growth, seed yield and quality of paprika chilli (*Capsicum annuum* L.). Karnataka J Agric. Sci. 2009; 22(4):132-136.
10. Natesh N, Vyakaranahal BS, Shekhargouda M, Deshpande VK. Effect of stratified harvesting of fruit on seed yield and quality of chilli. Karnatka J Agric Sci. 2005; 18 (2):505-507.
11. Panse VG, Sukhatme PV. Statistical Method for Agriculture Workers.2nd edition, ICAR publication. New Delhi. 1967, 381.
12. Priya K, Deshpande VK, Kumar HB. Influence of fertilizer level and seedling age on growth, flowering, seed yield and seed quality of parental line of chilli hybrid HCH- 9646. A Quarterly J Life Sci. 2013; 10(1):110-114.
13. Pandit MK, Adhikary S. Variability and heritability estimates in some reproductive character and yield in chilli (*Capsicum annuum* L.). International J of Plant & Soil Sci. 2014; 3(7):845-853.
14. Rajendra RK, Saxena R. Post-harvest profile of chilli. Ministry of Agriculture Report. Govt. of India. 2009, 6-8.
15. Ravihunje BS, Vyakarnahal, Jagadeesh RC. Influence of drying method of fruits on seed quality in chilli (*Capsicum annuum* L.). Karnataka J Agric. Sci. 2007; 20(2):269-271.
16. Rylski I. Effect of early environment on flowering in pepper (*Capsicum* annuum L.). Journal of American Society Horti. Sci. 1972; 97:648-651.
17. Smith RP, Basavaraja N. Variability and correlation studies in chilli (*Capsicum annuum* L.). Karnatka J Agric. Sci. 2006; 19(4):888-891.
18. Tanksley SD. High rates of cross- pollination in chilli pepper. Hort. Science. 1984; 19:580-582.
19. Vallejo CF, Garcia MA, Suarez D. Effect of different cultivar and fruit positions on seed production and quality in sweet pepper (*Capsicum annuum* L.). Acta Agrnomica, Universidad Nacinal de Colombia. Kharb, 1999.