

Assessment of Seed Quality Parameters in Coriander Genotypes (*Coriandrum sativum* L.)

Khyati Singh* and T.P. Malik

Department of Vegetable Science, CCS Haryana Agricultural University, Hisar, Haryana

*Corresponding Author E-mail: chaudhrykhyati@gmail.com

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ABSTRACT

Coriander (Coriandrum sativum L.) is most popular seed spice crops cultivated across India and can be considered as indispensable spice in the kitchen. Crop productivity is affected by the seed quality which determine the seed germination, vigour and viability. The experiment was conducted in the Research Farm of the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar during rabi season in the year 2018-19 to evaluate the performance of thirty coriander genotypes for identifying the suitable genotypes with higher seed quality. A wide range of variation and significant differences were reported among the genotypes for the six seed quality traits viz, test weight (g), standard germination (%), seedling length (cm), seedling dry weight (g), seed vigour index-I and seed vigour index-II. The assessment revealed that variation was highest for seed vigour index-I (1343.3-1903.3) followed by seed vigour index-II (107.2-198.0), standard germination (59.7-70.0), seedling length (22.1-28.2), test weight (8.3-13.4), while, it was low for seedling dry weight (1.8-2.8). The genotypes DH-306, DH-319, DH-313-1, DH- 325 and DH-308 were identified as the superior genotype in respect of their seed quality parameters taken under observation and they can be used for further breeding programmes.

Keywords: Genotypic variation, Test Weight, Seed Vigour Index-I, Seed Vigour Index-II and Standard Germination.

INTRODUCTION

Coriander (*Coriandrum sativum* L.) commonly known as *cilantro* in Spanish and *dhaniya* in Hindi belongs to family Apiaceae and has a chromosome number of $2n = 22$. It is native of Western Europe and Asia, it has been considered as an important seed spice crops

grown in India. Gujarat and Rajasthan are the major producers of coriander contributing to about 80% of total production in the country and are known as “seed spice bowl of India”. Coriander seeds have a pleasant aroma which adds flavour to the culinary dishes and used as spice for their several health benefits.

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It is also used in preparation of sauces, chutney, soups, salads, candy, chocolate, meat products and alcoholic beverages. Some of its imperative medicinal properties includes antioxidant, digestive stimulant, anti-hypertensive, cholesterol-lowering, anticancer effect which makes it desirable for curing many diseases like dyspepsia, flatulence, piles, indigestion, chronic cold and urinary tract infections.

The quality seed is prerequisite for the production of a healthy crop. It is reported that the use of quality seeds can raise the productivity of crop by 15-20% (Ambika, 2014). Further, as the seed spices have higher commercial value, the higher quality of seeds becomes more important. The seed quality can be measured by seed size, weight, density, germination percentage, moisture content, vigour index, seedling length and dry weight. Seed size is one of the important seed quality parameters that affects the seed germination, establishment and performance of the crop (Jerlin & Vadivelu, 2004; & Adebisi et al., 2011). The vigorous seeds are very beneficial with properties like rapid seedling emergence and higher plant stand (Deswal, 2017). This research paper focuses on studying the seed quality and vigour of coriander, based on which the superior genotypes are identified.

MATERIALS AND METHODS

The present experiment was conducted during *rabi* season 2018-2019 at Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana. The experimental site was located at the latitude of 29° 10' North and the longitude of 75° 46' East with a mean altitude of 215 m above MSL. Thirty coriander genotypes including three check (Hisar Anand, Hisar Bhoomit and Hisar Sugandh) were procured from the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar. The sowing of the seed was done on 4th November 2018 in randomized block design with three replications. All the diverse genotypes were sown in two rows at spacing of 50 × 15 cm in plot size of 3 × 1 m. The genotypes were distributed randomly in each block. All agronomic practices were done as

per recommended package practices and guidelines by the university in timely manner for successful raising a healthy crop. Crop was harvested after it had reached full maturity and harvested seeds were dried in shade under open field conditions for 3 to 4 days. Afterwards, seed samples were collected from properly dried and clean seeds for laboratory testing of the different seed quality parameters. The data was analysed statistically at 5 % level of significance ($p = 0.05$) as per the methods suggested by Panse and Sukhatme (1978). The seed quality parameters tested for the experiment are as follows:

Test weight (g): Thousand seeds were collected randomly from a seed lot per replication of each genotype and weighed using a digital weighing balance.

Standard germination (%): Fifty seeds per replication for each genotype were placed separately between the germination papers and kept at a temperature of 25 °C in the germinator. The first germination count was taken seven days after sowing and the final count was taken 21 days after sowing and the observations were expressed as percent seed germination (Fritz, 1965).

Seedling length (cm): Five randomly selected normal seedlings per genotype were taken to measure the seedling length from the three replications of standard germination test and recorded in centimetre at the end of test and averaged to determine the mean seedling length.

Seedling dry weight (g): Five normal seedlings per genotype, selected for measuring seedling length, were kept in a hot air oven and dried at 80°C for 48 hrs and then dry weight of seedlings was recorded in gram using a digital weighing balance. The average weight of five seedlings was taken for further calculations.

Seed Vigour Index- I: The formula suggested by Abdul Baki and Anderson (1973a) was used to calculate seed vigour index-I (SVI-I) *i.e.*, seedling length was multiplied with the standard germination of the same treatment.

$$\text{Seed Vigour Index-I} = \text{Standard germination (\%)} \times \text{Average seedling length (cm)}$$

Seed Vigour Index- II: To calculate seed vigour index- II (SVI-II), formula suggested by Abdul Baki and Anderson (1973b) was used *i.e.*, seedling dry weight was multiplied with the standard germination of the same treatment.

$$\text{Seed Vigour Index-II} = \text{Standard germination (\%)} \times \text{Average seedling dry weight (mg)}$$

RESULT AND DISCUSSION

The mean performance of coriander genotypes based on six quality parameters studied are summarised in Table 1. Test weight is the measure of density of grain and contribute to yield and quality of the seeds as it signifies the extent of development of seed and is considered as an important measure of seed quality. A significant difference was noted for this trait which ranged from 8.3 to 13.4 g, while, the general mean was recorded to be 10.24 g. Variation of test weight in the different genotypes is shown in Fig. 1. The genotype DH-313-1 recorded higher test weight (13.4 g) followed by Hisar Anand (12.2 g) and DH-314 (11.7 g). Eight genotypes were found to have higher test weight than the general mean. Similar results were reported by, Sengupta (2011) in fenugreek, Yadav (2016) in coriander and Deswal et al. (2017) in fennel.

Germination is known as the emergence and development from seed embryo into a young plant or a seedling. Standard germination test used to measure the emergence capacity of seed lots under favourable conditions (ISTA, 2003). The data obtained from experiment indicated significant variations in all the genotypes. Variation of germination percentage among the different genotypes is shown in Fig. 2. The maximum standard germination in percent was recorded in DH-313-1 (70.0%) followed by DH-319 (69.7%), DH-298 (67.4%) and DH-306 (67.4%). Among the 30 genotypes studied 12 genotypes had better standard germination than their overall mean performance (*i.e.*, 63.91%). It was found that the germination percentage was relatively higher for most of the genotypes having higher test weight like DH-

306 and DH-313-1, but it is not the case for all the genotypes. Soltani et al. (2002) and Pereira et al. (2008) reported similar results, stating that seed germination and development is higher for seeds with higher seed size, weight and density. Pramila et al. 2013 also explained that seed lots with higher test weight paralleled superior quality in terms of higher germination and seedling vigour. Lower seed germination percentage can be attributed to immature embryos and lower food reserves.

The data on seedling length (cm) and seedling dry weight (g) revealed that significant variations were apparent in all the genotypes. Variation of seedling length and seedling dry weight among the different genotypes is shown in Fig. 3. The maximum seedling length registered was found in the genotype DH-306 (28.2 cm) followed by Hisar Sugandh (27.3 cm) and DH-308 (26.4 cm). The maximum value of seedling dry weight was observed was 2.8 g reported in genotypes DH-308, DH-319, and DH-325. Thirteen genotypes had higher seedling dry weight than its mean value. It was established that the quality of seed was higher for the genotypes which has higher seedling length and seedling dry weight. This is in conformity with the results of the research done by Kumar (2017) who reported that with increase in seedling length, seedling fresh weight, seedling dry weight, vigour index-I, vigour index-II parameters, seed quality also increases and vice-versa. However, a negative association of seed size with germination percentage, seedling root and shoot length has also been reported by Kaya et al. (2008).

The study of results with regard to seed vigour index-I for different coriander genotypes differed significantly such that the mean performance of all the genotypes varied from 1343.3 to 1903.3 with the mean value being 1605.4. The maximum seed vigour index-I (1903.3) was recorded in genotype DH-306 followed by Hisar Sugandh, DH-313-1 with 1823.4 and 1775.6, respectively. Among all the 30 genotypes, 17 of them had higher seed vigour index-I than the mean value. Data recorded for seed vigour index-II

also demonstrated significant variations in all the coriander genotypes, it ranged from 198.0-107.2 (DH-319 and DH-303-2) with mean value of 152.94. Variation of SVI-I and SVI-II among the different genotypes is shown in Fig. 4. Difference in seedling characters can be attributed to the inherent genotypic variations and differential response to the environmental conditions as indicated by SVI-I and SVI-II. Similar results were observed by (Kumar, 2017).

Statistical analysis indicated that there is significant amount of variability among the various coriander genotypes under consideration for all seed quality parameters. Malik and Tehlan (2013) in coriander, Ravikumar et al. (2019) and Mamatha et al. (2017) in fennel reported the similar findings of high significant variability among the different genotypes.

Table 1: Mean performance of coriander genotypes for seed quality parameters

Genotypes	Test weight (g)	Standard germination (%)	Seedling length (cm)	Seedling dry weight (g)	Seed Vigour Index-I	Seed Vigour Index-II
DH-298	9.3	67.4	26.1	2.3	1758.6	157.6
DH-302	8.3	59.7	24.6	2.5	1467.0	147.9
DH-303	9.6	62.3	25.3	2.3	1576.4	142.8
DH-303-1	9.3	62.4	26.4	2.0	1647.4	124.4
DH-303-2	8.3	59.7	24.5	1.8	1462.0	107.2
DH-304	10.2	63.0	26.2	2.5	1650.2	155.4
DH-305	9.7	61.3	24.0	2.1	1472.6	130.0
DH-306	11.7	67.4	28.2	2.3	1903.3	156.3
DH-306-1	8.6	63.7	25.2	2.3	1607.6	143.3
DH-307	10.5	64.3	24.3	2.3	1564.4	149.8
DH-308	10.6	63.3	26.4	2.8	1670.8	174.2
DH-309	9.8	67.3	24.5	2.5	1651.3	164.8
DH-309-1	9.8	60.7	22.1	2.2	1343.3	135.4
DH-310	11.2	59.7	24.2	2.3	1443.6	139.7
DH-311	11.3	61.7	23.6	2.3	1456.7	144.4
DH-312	10.7	63.0	25.6	2.2	1612.2	141.1
DH-313-1	13.4	70.0	25.4	2.3	1775.6	159.5
DH-314	11.7	62.7	23.7	2.1	1488.0	134.2
DH-315	10.3	62.3	24.6	2.3	1532.8	145.9
DH-316	11.3	62.7	25.6	2.3	1605.7	143.0
DH-317	10.0	66.3	24.0	2.5	1592.8	168.4
DH-318	9.1	62.3	22.6	2.3	1405.6	140.8
DH-319	9.1	69.7	25.4	2.8	1771.4	198.0
DH-320	8.5	66.7	25.8	2.7	1719.8	176.8
DH-321	9.4	65.6	24.5	2.4	1606.1	154.2
DH-322	10.6	61.7	24.7	2.6	1525.8	160.4
DH-325	10.9	66.0	26.3	2.8	1737.8	182.2
Hisar Anand	12.2	64.0	26.0	2.7	1662.9	169.5
Hisar Phoomit	11.4	63.7	25.6	2.7	1627.7	173.9
Hisar	10.2	66.8	27.3	2.5	1823.4	167.2
Mean	10.24	63.91	25.09	2.39	1605.44	152.94
C.D. at 5%	0.72	3.15	0.99	0.11	114.05	10.67
C.V.	4.32	3.02	2.41	2.91	4.34	4.27

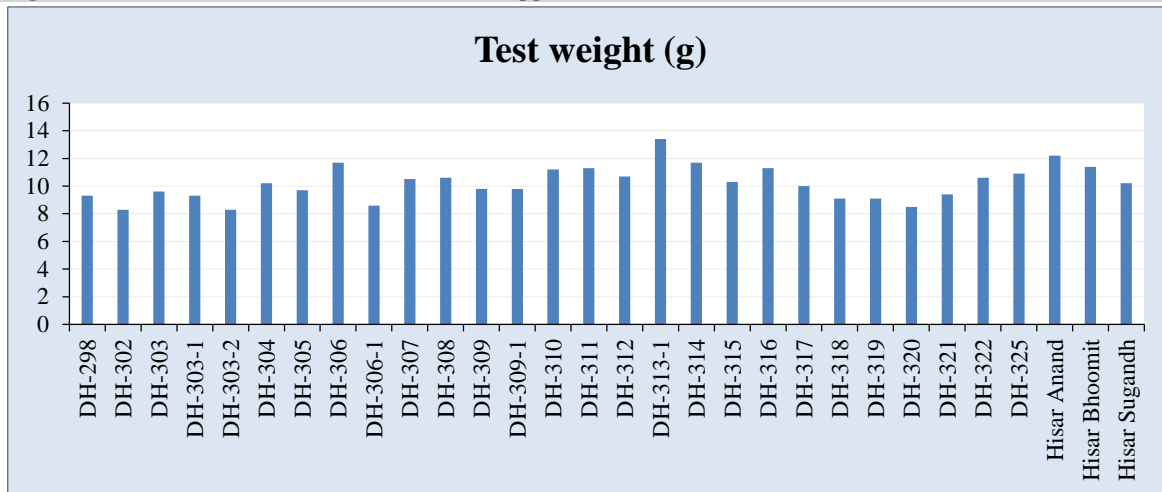


Fig. 1: Mean performance of coriander genotypes for test weight (g)

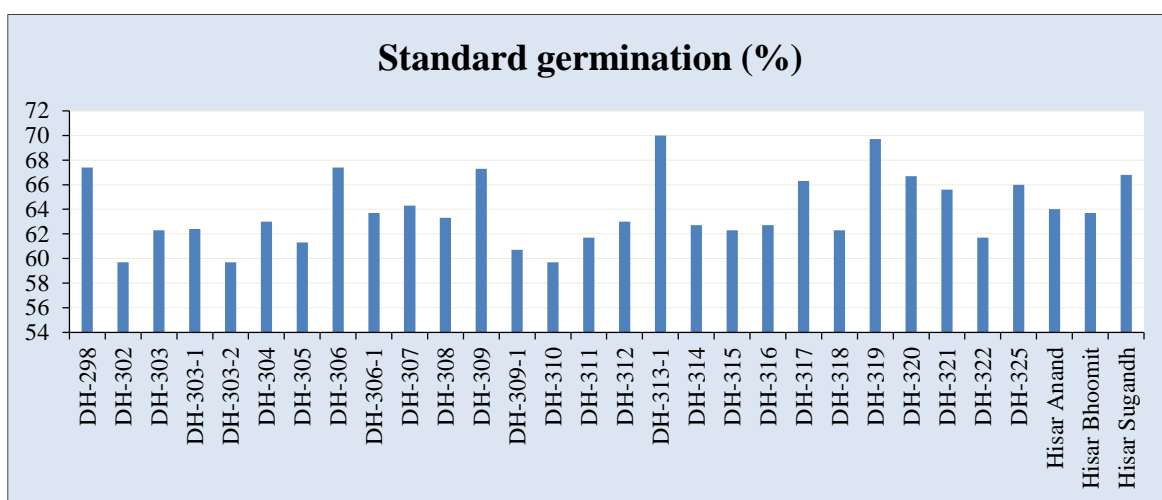


Fig. 2: Mean performance of coriander genotypes for standard germination (%)

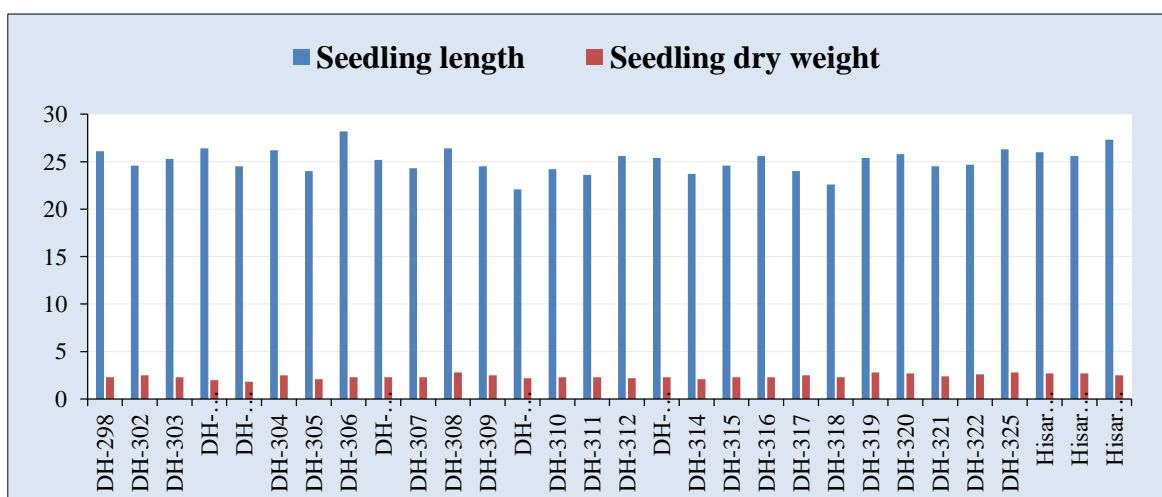


Fig. 3: Mean performance of coriander genotypes for seedling length (cm) and seedling dry weight (g)

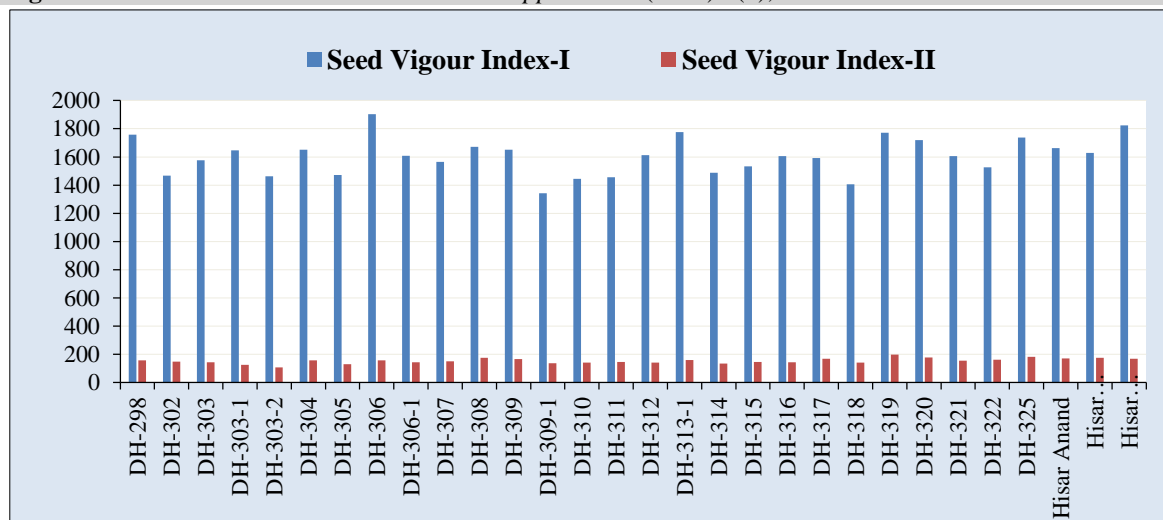


Fig. 4: Mean performance of coriander genotypes for seed vigour index-I and seed vigour index-II

CONCLUSION

The difference in various parameters among genotype can be attributed to the diverse genetic makeup of the genotypes, climatic suitability of a region, nutrient availability, harvesting stage, seed weight and size due to which the seed quality gets influenced. It can be concluded that the performance of genotypes can be affected by inherent genetic material as well as environmental factors. Among thirty genotypes of coriander studied, DH-306, DH-319, DH-313-1, DH-325 and DH-308 have been identified as the best genotype in respect of their better performance in terms of the seed quality parameters viz, test weight (g), standard germination (%), seedling length (cm), seedling dry weight (g), seed vigour index-I and seed vigour index-II and same can be used for further breeding programmes.

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