EVALUATION OF SEED QUALITY IN NATURALLY AGED SEED LOTS OF CORIANDER

ABSTRACT: Three seed lots of fifteen genotypes of coriander were subjected to study the effect of natural ageing on different seed quality parameters. Results revealed that all the genotypes showed the germination percentage above the Minimum Seed Certification Standards (65%) in Lot-1 (freshly harvested seed) and Lot-2 (1 year old seed). Standard germination (%), seedling length (cm), seedling dry weight (mg), seedling vigour index-I & II and accelerated ageing test(%) revealed that quality of seeds declined with faster rate inLot-3 (2 years old seed). Among all the genotypes, maximum germination was retained by genotype DH-339 (75.58%) followed by Hisar Surbhi (74.50%) and maximum loss of germination was observed in genotype DH 352-1 (61.25%). Hence, the genotypes DH-339 and Hisar Surbhi were found superior in terms of viability, vigour and storability whereas genotype DH 352-1 was found poor under ambient conditions.

Keywords: Ageing, Coriander, Germination (%), Seed lots, Seed quality

1. INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an annual herb belonging to the family umbelliferae (Apiaceae) and is native of Mediterranean region. It is an important seed spice crop, which occupies a prime position in flavoring substances. All parts of this herb are in use as flavoring agent and/or as traditional remedies for the treatment of different disorders in the folk medicine systems of different civilizations [1]. Coriander has been reported to posses many pharmacological activities like antioxidant [2], anti-diabetic [3] and anti-mutagenic [4].

Quality seed is the basic unit for releasing higher yield per unit area. The quality seed not only enables the farmers to take economic decisions regarding cost of seed but also helps them to have idea about the quality of seed to plant, uniformity of plant stand and consequently the net returns. Therefore, the availability of genetically pure and vigorous seed at planting

time is important for achieving target of agriculture production. Use of quality seeds increased productivity of crop by 15-20% [5].

Seed is considered as one of the important basic agricultural inputs for obtaining higher yield. After harvesting several field crops seeds keep in storage conditions for some days, weeks, months or years. Seed storage conditions can determine germination characteristics and vigor potential of seeds [6] storage time and relative humidity of store can affect vigor of seeds [7].

Among the seed spices, coriander is very susceptible to loss in quality in terms of seed viability and vigour during seed storage. One of the approaches adopted in this direction is to identify the physiological and biochemical changes accompanying seed deterioration during seed storage, as its seed deteriorates during prolonged storage. Since the viability of carryover seed lots deteriorates rapidly; therefore, the prior assessment of seed quality is important to plant only the viable seed in the coming season. Therefore, the present study was aimed at to assess the seed quality parameters of seeds of different genotypes of coriander stored under ambient conditions.

2. MATERIAL AND METHODS

The present investigation was carried out on coriander seeds of fifteen genotypes *viz*., DH-333-1, DH-336, DH-337, DH-338,DH-339, DH-340, DH-341, DH-343, DH-344, DH-345, DH-352-1, Hisar Anand, Hisar Sugandh, Hisar Bhoomit and Hisar Surbhi with three lots of seed *viz*., freshly harvested seed (Lot-1), one year old seed (Lot-2) and two year old seed (Lot-3) collected from Department of Vegetable Science, CCS H.A.U, Hisar during 2014-15. All the 3 seed lots stored under ambient condition (uncontrolled storage) were subjected to standard germination test (%), seedling length (cm), seedling dry weight (mg), seedling vigour index-I, seedling vigour index-II and accelerated ageing test (%) in seed testing laboratory, Department of Seed Science and Technology, CCS Haryana Agricultural University.

2.1 Test weight (g)

A random sample of seeds was drawn from each lot of naturally aged seeds of coriander and 1000 seeds were selected without discrimination for their size and appearance and weight of these 1000 seeds denotes the test weight of that seed lot.

2.2 Standard germination (%)

Hundred seeds were picked from each seed lot for 15 genotypes and placed in between sufficient moistened rolled towel papers in four replicates and kept at 25ºC in seed germinator. The final count was taken on 21st day and only normal seedlings were considered for percent germination as per rules of International Seed Testing Association [8].

2.3 Seedling length (cm)

Seedling length was measured on ten randomly selected normal seedlings taken from four replications of standard germination test and recorded in centimeter. At last, average of ten seedlings was recorded in centimeters for final calculations.

2.4 Seedling dry weight (mg)

Seedling dry weight was assessed after the final count in the standard germination test (21 days). The 10 seedlings of each genotype replicated four times and dried at 80ºC for 48 h and the seedling dry weight was recorded in milligram.

2.5 Seedling vigour indices

Seedling vigour indices were calculated according to the method suggested [9]:

Vigour index-I (on seedling length basis):

Vigour index-I = Standard germination (%) x seedling length (cm)

Vigour index-II (on seedling dry weight basis):

Vigour index-II = Standard germination (%) x seedling dry weight (mg)

2.6 Accelerated ageing test (%)

For accelerated ageing test (%) sufficient number of seeds in a single layer from each genotype was taken on wire mesh tray fitted in plastic boxes having 40 ml of distilled water. The boxes were placed in ageing chamber after closing their lids. The seeds were aged at 40±1°C temperature and about 100 % RH for 120 hours. Aged seed will be subjected to germination test as mentioned earlier.

3. RESULTS AND DISCUSSION

Significant differences were found among all the genotypes and ageing periods for test weight (Fig. 1). In freshly harvested seed lot maximum test weight was recorded in Hisar Surbhi (18.18g) which was followed by DH-339 (18.10g) and minimum test weight was recorded for DH-341 (13.98g). High test weight of freshly harvested seed may be due to the commencement of rainy season at time of harvesting and storage which increased the moisture content of seed.

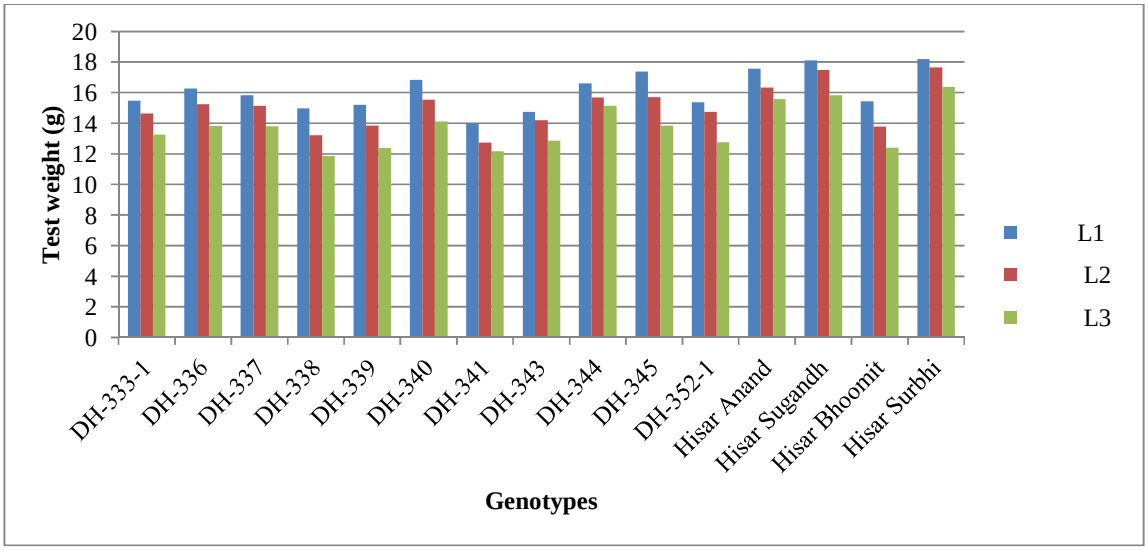

Figure 1: Effect of natural ageing on test weight (g) of coriander genotypes

Test weight decreased due to deterioration of seed tissues with advancement of ageing period in all the fifteen genotypes. The results indicated that the genotype Hisar Surbhi (17.40 g) recorded highest mean test weight whereas DH-341 recorded lowest (12.96 g). Maximum

(3.54 g) decrease in test weight was recorded for DH-345 and minimum (1.44 g) in DH-344 from fresh seed lot to two year old seed lot. Similar finding was reported in coriander (*Coriandrum sativum* L.) [10] and in fenugreek [11].

In freshly harvested seed lots and one year aged seed lots, all the genotypes showed germination percentage above Minimum Seed Certification Standards (65.00 %). Among all genotypes and seed lots Hisar Surbhi (90.2%) recorded highest germination followed by DH-339 (90.0%) whereas the genotype DH-352-1 recorded lowest germination (74.7%) in freshly harvested seed lot. Thereafter standard germination decreased gradually with the advancement of storage period among all the genotypes (Table 1). Standard germination declined with a faster rate in two year aged seed lot as compared to one year aged seed lot. The maximum standard germination was recorded in DH-339 (60.7%) followed by Hisar Surbhi (58.7%) and lowest in DH-352-1 (43.5%) in two year aged seed lot. The change in the seed viability under ambient storage conditions is a function of a complex interaction of genetic constitution and environmental conditions. The present results are also in corroborate with the findings of Kumar *et al*. [12] where loss of seed viability and vigour increased with increase in period of storage in coriander. Above results are in close agreement with various workers in different crops such as okra [13], Indian mustard [14], fenugreek [15], carrot [16], turnip [17] and in four seed vegetables i.e. carrot, cucumber, onion and tomato [18].

Table 1: Effect of natural ageing on standard germination (%) of coriander genotypes

Genotypes	**Seed lots**			**Mean**
	L_1	**L_2**	**L_3**	
DH-333-1	75.7 (60.4)	67.0 (54.9)	54.5 (47.5)	65.7 (54.3)
DH-336	84.7 (67.0)	73.0 (58.6)	50.2 (45.1)	69.3 (56.9)
DH-337	80.2 (63.6)	65.2 (53.8)	50.7 (45.4)	65.4 (54.2)
DH-338	77.5 (61.6)	67.2 (55.0)	46.0 (42.6)	63.5 (53.1)
DH-339	90.0 (71.6)	76.0 (60.6)	60.7 (51.1)	75.5 (61.1)
DH-340	76.5 (61.0)	66.7 (54.7)	45.0 (42.1)	62.7 (52.6)

DH-341	80.2 (63.6)	69.7 (56.6)	45.0 (42.1)	65.0 (54.1)
DH-343	79.7 (63.2)	72.2 (58.2)	46.5 (42.9)	66.1 (54.8)
DH-344	83.2 (65.8)	68.2 (55.7)	47.0 (43.2)	66.1 (54.9)
DH-345	80.7 (63.9)	69.7 (56.6)	47.2 (43.4)	65.9 (54.6)
DH-352-1	74.7 (59.8)	65.5 (54.0)	43.5 (41.2)	61.2 (51.6)
Hisar Anand	80.5 (63.7)	68.2 (55.6)	52.7 (46.5)	67.1 (55.3)
Hisar Sugandh	82.2 (65.0)	70.5 (57.0)	44.2 (41.6)	65.6 (54.6)
Hisar Bhoomit	76.5 (61.0)	68.5 (55.8)	45.7 (42.5)	62.9 (53.1)
Hisar Surbhi	90.2 (71.8)	74.5 (59.6)	58.7 (50.0)	74.5 (60.5)
Mean	80.8 (64.2)	69.5 (56.4)	49.2 (44.5)	

C.D. (p = .05) for genotypes = 1.059, lots = 0.474, Genotypes x lots = 1.835

Figures in parenthesis are arcsine value

All the genotypes recorded maximum seedling length (Fig. 2) at the commencement of storage and thereafter, it declined as the period of ambient storage advanced. Seedling length in all the fifteen genotypes decreased significantly with the advancement of ageing period. Seedling length showed a variation in freshly harvested seed of different genotypes from 27.45 to 33.09cm with a general mean of 30.35cm. The maximum average value for seedling length was recorded for genotype DH-339 (28.67cm) followed by Hisar Surbhi (28.27 cm) and minimum (21.85cm) for DH-352-1. The maximum decrease (13.45cm) in seedling length was recorded for DH-338 and minimum (6.10cm) for DH-333-1 from fresh seed lot to two year old seed lot. The reduction in the physical and physiological manifestation of vigour during storage could be attributed to the irreversible deteriorative changes occurring in them as a result of ageing [19]. Similar findings were also reported in fenugreek [11, 15], in coriander [10, 20] and in turnip [17].

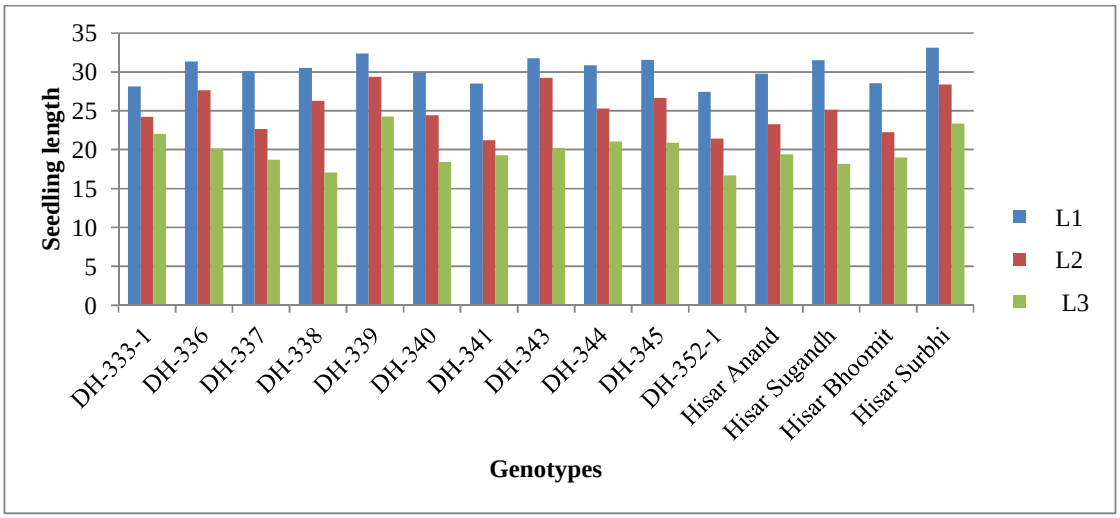

Figure 2: Effect of natural ageing on seedling length (cm) of coriander genotypes

Among all the genotypes, DH-340 recorded highest value of seedling dry weight (35.40mg) and followed by DH-339 having dry weight (33.63mg) whereas genotype DH-352-1 recorded lowest dry weight (22.20mg) in freshly harvested seed lot (Fig.3). Highest mean seedling dry weight was observed in DH-340 (32.09mg) followed by Hisar Surbhi (31.14mg) and lowest in DH-352-1 (19.76mg). These observations were similar to those already reported by various workers in different crops such as in urd bean, mung bean [21] and in fenugreek [11]

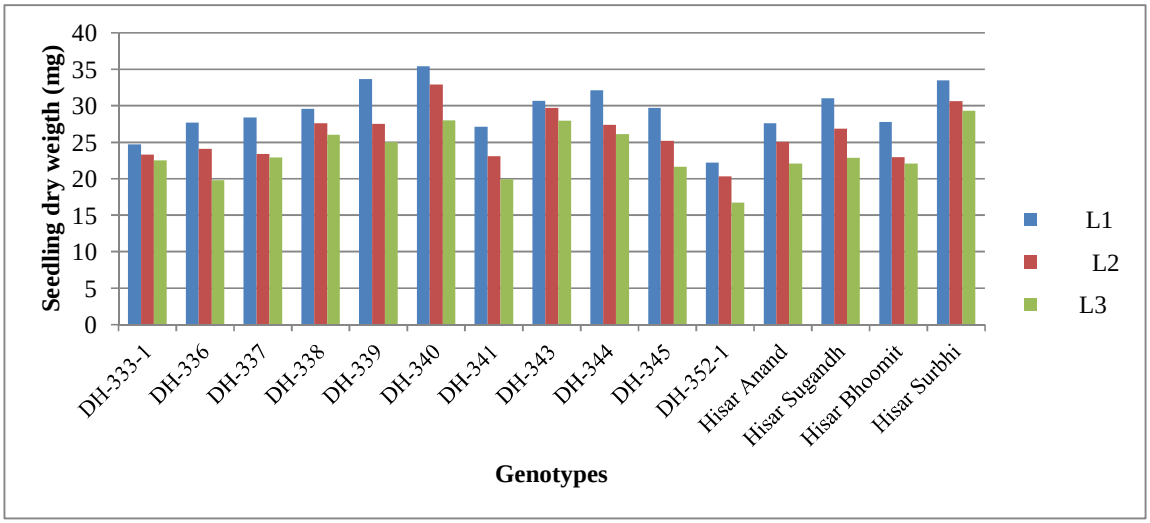

Figure 3: Effect of natural ageing on seedling dry weight (mg) of coriander genotypes

The standard germination test fails to account for the progressive nature of seed deterioration and the seeds are merely classified as either germinable or non-germinable with no distinction between strong or weak seedlings. These weaknesses have encouraged the interest in vigour testing to provide information about the vigour and viability of seed, which has not been realized by standard germination test. Results indicated that seedling vigour indices declined significantly in all the varieties/genotypes with the passage of seed storage time, vigour index-I ranged from 725.24 (two year aged seed) to 2986.33 (freshly harvested seed). The genotype Hisar Surbhi showed maximum value (2986.33) followed by DH-339 (2910.96) and minimum in DH-352-1 (2051.48) in freshly harvested seed lot as shown in Fig. 4. Highest mean vigour index–I was observed in DH-339 (2206.74) followed by Hisar Surbhi (2157.21) and lowest in DH-352-1 (1393.18). Therefore, among all the genotypes, DH-339 was found more vigorous than other genotypes. Vigour index –II ranged from 1660.20 (DH-352-1) to 3022.65 (DH-339) among genotypes for fresh seed lot. In freshly harvested seed lot, the maximum value of seed vigour index-II was recorded in DH-339 (3022.65) followed by Hisar Surbhi (3019.22), which were statistically at par and lowest in DH-352-1 (1660.22) However in two year old seed lot, the maximum value of seed vigour index-II was recorded in Hisar Surbhi (1724.97) and minimum was recorded in DH-352-1 (728.65) as shown in Fig. 5. The maximum average value for seed vigour index (2341.81) was observed for genotype Hisar Surbhi followed by DH-339 (2209.39) and minimum for DH-352-1 (1240.47). The present results substantiate with the findings of Kumar *et al*. [12] in coriander and Rajkumar *et al.* [22] in pea where loss of vigour increased with increase in period of storage

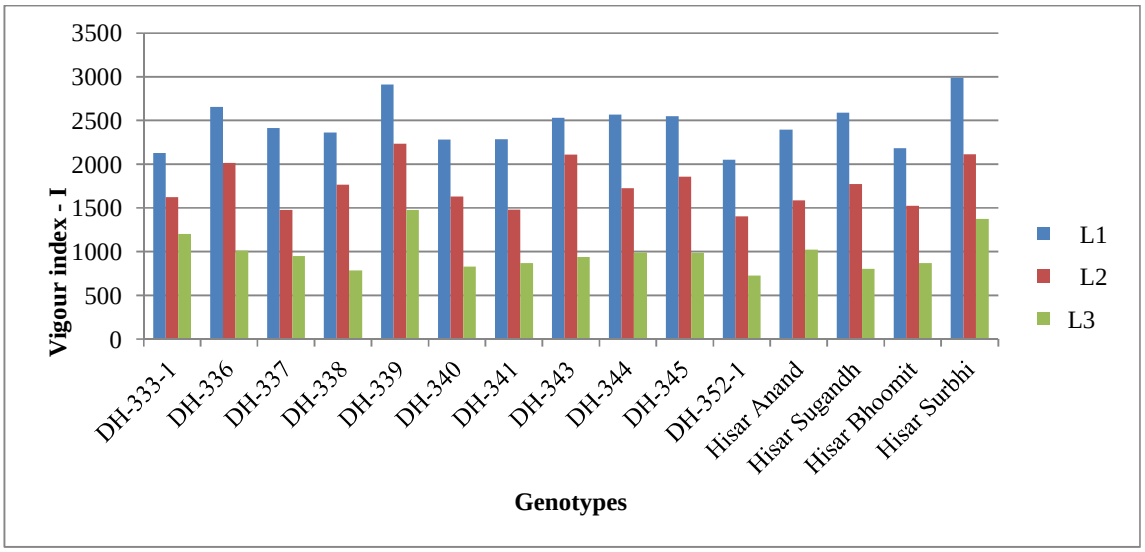

Figure 4: Effect of natural ageing on Vigour index –I of coriander genotypes

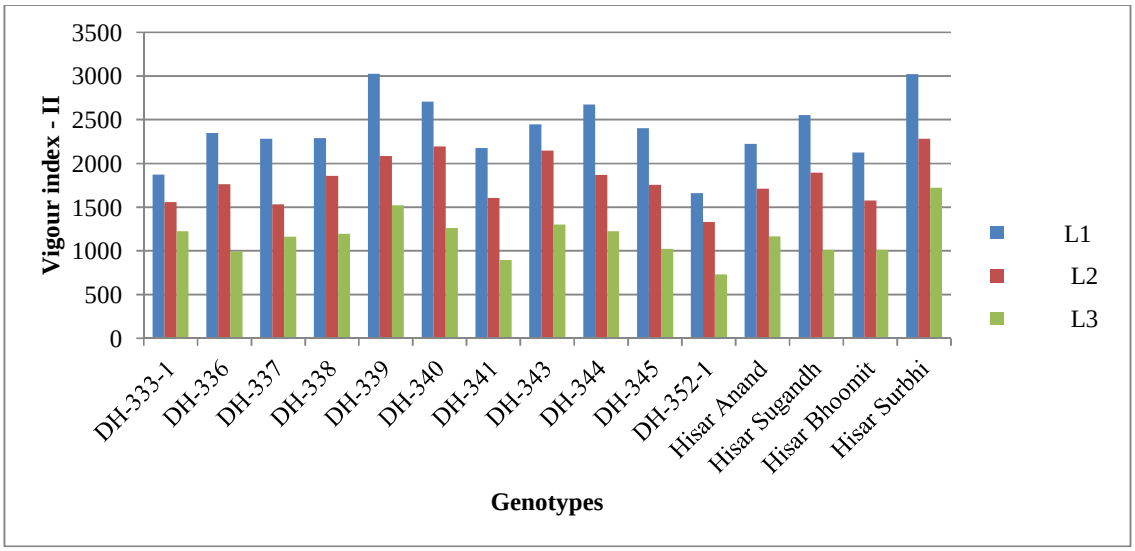

Figure 5: Effect of natural ageing on Vigour index –II of coriander genotypes

Different seed lots of different genotypes of coriander were subjected to accelerated ageing treatment and the percentage germination of normal seedlings are presented in Table 2. The range of percentage germination for different genotypes varied from 70.0% (Hisar Surbhi) to 50.2% (DH-352-1) in freshly harvested seed, 50.5% (DH-345) to 28.7% (DH-352-1) in one year old seed lot, 25.0% (DH-345) to 9.2% (DH-352-1) in two year old seed lot. The genotype DH-345 (47.9%) and Hisar Surbhi (46.3%) recorded significantly high mean percentage of

normal seedlings because these genotypes strongly resisted the accelerated ageing up to certain period, hence could be classified as a good storer. The decline in seed germination and vigour during accelerated ageing as well as storage treatments were influenced by chronological age of seed rather than initial germination percentage [23]. The possible reason of this reduction might be the lowering of biochemical activities in seeds. Ageing have damaging effect on enzymes that are necessary to convert reserve food in the embryo to usable form and ultimately production of normal seedling [24].The similar results were also reported in coriander [12] and in fenugreek [25].

Table 2: Effect of accelerated ageing on germination (%) of seeds of coriander genotypes

Genotypes	Seed lots			Mean
	L_1	L_2	L_3	
DH-333-1	52.0 (46.1)	33.7 (35.4)	21.2 (27.4)	35.6 (36.3)
DH-336	64.7 (53.5)	44.7 (41.9)	19.5 (26.1)	43.0 (40.5)
DH-337	56.7 (48.8)	36.2 (36.9)	16.5 (23.8)	36.5 (36.5)
DH-338	56.2 (48.5)	39.2 (38.7)	18.0 (25.0)	37.8 (37.4)
DH-339	67.2 (55.0)	41.0 (39.7)	21.5 (27.5)	43.2 (40.8)
DH-340	52.2 (46.2)	34.5 (35.9)	17.0 (24.3)	34.5 (35.5)
DH-341	57.2 (49.1)	37.5 (37.7)	17.0 (24.3)	37.2 (37.0)
DH-343	64.7 (53.5)	36.5 (37.1)	19.2 (25.9)	40.1 (38.9)
DH-344	61.2 (51.4)	48.0 (43.8)	14.7 (22.5)	41.3 (39.2)
DH-345	68.2 (55.6)	50.5 (45.2)	25.0 (29.9)	47.9 (43.6)
DH-352-1	50.2 (45.1)	28.7 (32.4)	9.2 (17.6)	29.4 (31.7)
Hisar Anand	60.0 (50.7)	40.2 (39.3)	19.5 (26.1)	39.9 (38.7)
Hisar Sugandh	62.2 (52.0)	39.2 (38.7)	16.7 (24.1)	39.4 (38.3)
Hisar Bhoomit	53.7 (47.1)	33.2 (35.1)	18.2 (25.2)	35.0 (35.8)
Hisar Surbhi	70.0 (56.7)	47.0 (43.2)	22.0 (27.9)	46.3 (42.6)
Mean	59.8 (50.6)	39.3 (38.7)	18.3 (25.2)	

C.D. (p = .05) for genotypes =1.191, lots =0.533, Genotypes x lots = 2.064

Figures in parenthesis are arcsine values

4. CONCLUSION

From the present investigation, it was observed that the viability and vigour of coriander seeds decreased as the age of the seeds increased and it can be concluded that the

seeds more than one year old should not be used for sowing purpose by the farmers as the quality of the seeds of all the genotypes declined with fast rate in two year old seed under natural storage conditions and if they have their leftover seed it should be used after increasing the seed rate so that optimum plant population can be maintained. Among the genotypes, the genotype DH-339 and Hisar Surbhi were found most promising in respect of vigour, viability and storability and these genotypes may be used for further breeding programme whereas genotypes DH 333-1 and DH 352-1 were found poor under naturally stored condition.

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