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Correlation of seed vigour with field emergence in lentil varieties (*Lens culinaris*)

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Abstract
The investigation was carried out at the laboratory of Department of Seed Science & Technology CSAUA & T Kanpur in 2018-19. Seeds of five lentil varieties *viz*., KLS 9-3, KLS 320, KLB 345, KLB 303 and KLB 8-4 were investigated for vigour parameters as test weight, Tetrazolium test, seed germination and brick gravel test and these vigour parameters were correlated with field emergence and found that seed vigour was significantly differed among varieties for all parameters, and significantly superior value *viz.* Tz-test (45.50%), seed germination (97.00%), seedling length (25.53 cm), SVI-I (2476.74), SVI-II (8.57) were found in variety KLB 303 while maximum seedling dry weight (0.089 g) and test weight (26.41 g) were found in Variety KLB 8-4 and maximum brick gravel test (36.00%) was found in variety KLS 320. All vigour parameters were positively correlated with field emergence except test weight.

Keywords: *Lens culinaris*, seedling length, KLB 303

1. Introduction
Lentil is a major *Rabi* season pulses crop which contains about 25% protein and 60% carbohydrates. It is also rich in calcium, iron, and niacin. Seed (a living embryo) is a vital, cheap and basic input for attaining sustained growth in agriculture; a successful crop depends on the quality of the seed used for sowing. Seed quality is primarily determined by its purity, viability, vigour and germination, the test weight is also a measure of strength. After germination, larger seeds retain a larger portion of their food reserves that can be mobilized for seedling growth (Green and Junpper, 2004) [9]. The availability of viable and vigorous seed at the time of planting is important for achieving agricultural production goals, as quality seed acts as a catalyst to exploit the full potential of other inputs. Seed quality is affected by various components of the seed. Seed having poor Germin ability and vigour results in a poor crop stand which ultimately reduces the yield.

Seed vigour has been recognized as one of the important aspects of seed quality, its impact on crop performance has been variable in different species. The Tz-test, germination test is most widely used to evaluate the plant stand establishment potential of seeds. However in many cases it has been noticed that it showed varying results with regard to field stand. Brick gravel test is a test to know how much seed is able to germinate in adverse conditions. High vigorous seeds are those which perform well after sowing, whereas those which perform poorly are called low vigorous seeds. Seed is one of the cheapest techniques for increasing production but low vigour associated with poor quality often becomes a limiting factor of production. Differences in vigour are only revealed in practice when germination tests fail to indicate emergence differences in the field. There are also many laboratory reports where seed lots have similar germination but large differences in their ability to germinate in the field (Matthews, 1980). The establishment of good plant stands is one of the requirements for higher production. It was found that plants from higher quality seed produce 18% higher yield than those obtained from low quality seed (Bishnoi & Delouche, 1980). Seed which performs well in some or all of these aspects is termed high-vigour seed (Bewely and Black, 2000). To ensure a proper field stand of the crop under limited source one should use seed with high vigour. Keeping in view, the above fact the experiment was planned to determine the vigour of lentil varieties and their correlation with field emergence.

2. Materials and Methods
Seeds of five lentil (*Lens culinaris*) varieties namely KLS 9-3, KLS 320, KLB 345), KLB 303 and KLB 8-4 were taken from seed processing plant of CSAUAT, Kanpur.

Experiment was conducted at Seed Testing Laboratory, Department of Seed Science & Technology, CSAUAT, Kanpur. The following tests were employed to determine the seed vigour of different varieties of lentils-

2.1 Test weight (TW g)
1000 seed weight was noted down by random sampling with three replications for each treatment. The unit of weight was gram.

2.2 Tetrazolium test (TT %)
This test was performed in three replications of 100 seeds each. The seeds were put in water at room temperature for 12 hours. From soaked seeds, seed coat was removed without damage to seed, emerged in 2, 3, 5- triphenyl tetrazolium chloride solution and kept in dark at 30 degree centigrade for 5 hours. After treatment colored seeds were washed in water, examined and evaluated.

2.3.1 Standard Germination (SG %)
Three replications with100 seeds per replication from each variety were placed in between paper at 20±1 ^{0}C and final counting was made on the 10th day (ISTA 1985) and normal seedlings were expressed as percent germination.

$$\text{Germination \%} = \frac{\text{Number of seed germinated}}{\text{Total number of seed planted}} \times 100$$

2.3.2 Seedling length (SL cm)
Ten normal seedlings at the time of final count were randomly selected from each replication of all the varieties/genotypes and there was measured in cm. Average length of these seedlings was calculated.

2.3.3 Seedling dry weight (SDW g)
Ten normal seedlings which were used for measurement of seedling length were also used for seedling dry weight measurement. These were dried in a hot air oven at 80 ^{0}C temperature for 24 h. Then seedlings were removed from the oven and allowed to cool in a desiccator for 30 minutes and weighed.

2.3.4 Seedling vigour index I&II
Seedling vigour indices were calculated by using the formula suggested by (Abdul-Baki and Anderson, 1973) [1] by the formula given below:-

Seedling Vigour Index-I=Seed germination % x Seedling length (cm)

Seedling Vigour Index-II=Seed germination % x Seedling dry weight (g)

2.4 Brick gravel test (BGT %)
Three replications of 100 seeds each for every treatment were taken, seeds were placed on the quartz sand in the boxes. The seeds were covered with a layer of approximate 3-5 centimeter moist morable chips of about 2-3 millimeter in thickness. The morable chips were kept moistened throughout the experimental period. The breakers were kept in the germination room at 25 ^{0}C. The seedlings that emerged above the surface of morable chips were counted on the 5th and 10th day, after the commencement of the test, the latter being cumulative counts.

2.5 Field emergence (FE %)
Three replications of one hundred seeds of each variety sown in the field and emergence of seedling were counted after 21 days of sowing and expressed in percentage.
The data recorded were subjected to statistical analysis in completely randomized block design and correlated with Field emergence.

3. Results and Discussion
In present investigation five lentil varieties were evaluated on their vigour parameters and results of evaluation were mentioned in table 3.1

Table 3.1: Seed vigour of lentil varieties on different parameters and their correlation with field emergence

Varieties	TW (g)	TT (%)	SG (%)	SL (cm)	SDW (g)	SVI-I	SVI-II	BGT (%)	FE (%)
KLS 9-3	17.68	37.25	90.00	17.85	0.063	1611.19	5.71	29.00	86.25
KLS 320	23.88	43.25	95.00	20.76	0.076	1971.86	7.19	36.00	89.50
KLB 345	25.40	37.50	86.75	20.64	0.085	1791.08	7.38	25.00	83.00
KLB 303	19.58	45.50	97.00	25.53	0.088	2476.74	8.57	32.50	91.50
KLB 8-4	26.41	41.00	92.00	22.45	0.089	2056.19	8.18	35.00	87.50
CD @ 5%	3.76	1.24	2.20	0.65	0.011	39.09	0.65	1.10	2.22
SE(m)	1.25	0.41	0.73	0.00	0.004	12.96	0.21	0.36	0.74
r value	-0.486	0.92	0.99	0.63	0.228	0.78	0.45	0.77	

All vigour parameters showed significant difference among varieties and all parameters were significantly correlated with field emergence except test weight. Maximum test weight 26.41 g was recorded in variety KLB 8-4 while TW of variety KLS 320 (23.88 g) and KLB 345 (25.40) were at par with KLB 8-4 but correlation with field emergence was found negative and non-significant, these finding differed from findings (Singh *et al*., 2010) [16] in pea and (Kapoor, 2011) in black-gram. Highest tetrazolium test performance was recorded in variety 303 (45.50%) followed by variety KLS 320 (43.25%) and the correlation between tetrazolium test and field emergence was positive and highly significant. These findings were supported by (Tewari, 2002) [17] in onion and (Kapoor, 2011) in black-gram. Standard germination showed significant differences among the varieties. However, maximum seed germination (97.00%) was recorded from the variety KLB 303 followed by KLS 320 (95.00%) the correlation among seed germination and field emergence was found positive. Similar findings reported by (Singh *et al*., 2010) [16] in pea & (Dighe, 2010) [8] in sorghum. Seedling length also exhibited significant differences among the variety, maximum seedling length (25.53 cm) was recorded from KLB 303. The correlation between seedling length and field emergence was found to be significant. Similar findings

were reported by (Dahiya *et al*., 2002) in paddy and (Chaudhary, 2008) [3] in Lentil. The seedling dry weight of five varieties of lentil exhibited significant difference among all the varieties; however maximum seedling dry weight (0.089g) was recorded from varieties KLB 8-4, but the correlation between seedling dry weight and field emergence was non-significant. The result differed from the results of (Mahajan and Nayeem, 1989) [12] in wheat & Tripathi, 2011) [18] in green gram. Seedling vigour index-I exhibited significant differences among the varieties, maximum SVI-I was recorded from variety KLB 303 (2476.74). The correlation between SVI-I and field emergence was found significant. This result was supported by (Tewari *et al*., 2002) [17] in onion (Tripathi, 2004) in wheat and (Singh, 2012) [15] in okra. The SVI-II varied significantly among the varieties and maximum SVI-II (8.57) was recorded from KLB 303. The correlation was found to be significant between SVI-II and field emergence. This result was supported by (Tripathi, 2011) [18] in green gram and (Chauhan and Kharb, 2002) [5] in cowpea. The brick-Gravel test exhibited significant variation among the varieties and highest value was recorded from variety KLS 320 (36.00%). The correlation was found significant between brick-gravel test and field emergence. These findings differed from Hussaini (1984) [10] in maize & from Singh, (2012) [15] in okra.

These variation among varieties are may be due to genetic makeup of varieties or due to the accumulation of food reserves in seeds (Rai *et al.*, 2017) [14] reported that performance of varieties in respect to seed viability, germination %, seedling length, seedling dry weight and seedling vigour index I & II were differ each other similar findings were reported by (Das *et al.*, 2020) [7].

4. Conclusion

On the basis of above discussed result it may be concluded that the variety KLB 303 showed superiority in field emergence, standard germination, total seedling length, seedling vigour index-I & II, tetrazolium test and also showed numerically better performance in other vigour test while lowest performance was exhibited by variety KLS 9-3 and KLB 345 in most of the parameters vigour test. In order to assess the correlation between field emergences with different vigour test methods, standard germination, tetrazolium test and brick-gravel test to be more suitable for prediction of seed vigour of lentil during present investigation.

5. References

1. Abdul Baki AA, Anderson JD. Vigour determination in Soyabean seed by multiple criteria. Crop Science. 1973;13(6):630-633.
2. Bewley JD, Black M. Seeds Physiology of development and germination. New York, press; c1994.
3. Chaudhary AK. Evaluation of seed vigour and their relationship to field emergence in Lentil (*Lens culinaris medik*) genotypes. Thesis submitted in CSAUAT, Kanpur; c2008.
4. Chauhan JS, Meena M, Saini M, Meena DR, Singh M, Meena S, Singh KH. Heat stress effects on morpho-physiological characters of Indian mustard (*Brassica juncea* L.). In Proceeding of 16th Australian Research Assembly on Brassicas. Ballarat, Victoria. 2009 September 14–16.
5. Chauhan R, Kharb RPS. Seed vigour studies in cowpea (*Vigna unguiculator* L.). In Proceeding of 11th National Seed Seminar on Quality Seed to enhance agriculture profitability at Univ. of agriculture science, Dharwad, c2002, p. 213.
6. Dhaiya OS, Dhaiya BS, Punia RC. Seed germination rate (S.G.R) and its associated characters in paddy (*Oryza sativa*).In Proceeding of 11th National Seed Seminar on Quality Seed to Enhance Agricultural Profitability at Univ. of Agriculture Science, Dharwad, 2002 Jan 18-20, p.190.
7. Das R, Biswas S, Biswas U, Dutta A. Growth Yield, Seed and Seedling Quality Parameters of Rapeseed-mustard Varieties under Different Seed Priming Options International Journal of Environment and Climate Change. 2020;10(3):1-14.
8. Dighe RS. Evaluation of seed vigour tests in sorghum (*sorghum bicolor* (L) Moench). In Proceeding of National Symposium on "Food Security in Context of Changing Climate" organized by The Society of Agriculture professionals Kanpur. 2010;5(31):101.
9. Green PT, Junpper PA. Seed-seedling allometry in tropical rain forest: seed mass related patterns of resource allocation and the reserve effect, Journal of Ecollogy. 2004;92:397-408.
10. Hussaini SH, Sarada P, Reddy BM. Effect of seed size on germination and vigour in Maize. Seed Research Journal. 1984;12(2):98-101.
11. International Seed Testing Association. International rules for seed testing. Seed Science and Technology. 1985;13(2):299-513.
12. Mahajan AR, Nayeem KA. Character association and path analysis for seedling vigour index in wheat species and triticale under different temperature. Seed Research Journal. 1989;17(1):32-35.
13. Panda BB, Bandopadhyay, Shivay YS. Effect of irrigation level, sowing dates and varieties on yield attributes, yield consumptive water use and water use efficiency of Indian Mustard (*Brassica juncea).* Indian Journal of Agricultural Sciences. 2004;74(6):339-342.
14. Rai H, Peerzada OH, Dahiya OS, Jakhar SS. Seed Vigour Assessment in Different Varieties of Indian mustard (*Brassica juncea* (L.) Czern. & Coss.) International Journal of Current Microbiolpgy and Applied Sciences. 2017;6(10):1930-1936.
15. Singh A. Seed vigour assessment in relation to field emergence of okra [*Abelmoschus esculentus* (L.) Moench]. Thesis, submitted in CSAUAT, Kanpur, 2012.
16. Singh CB, Gupta PK, Verma JK, Khan AA, Katiyar RA. Standardization of seed vigour test methods in pea (*pisum sativum* L.). National Symposium on 'Food Security in Context of Changing Climate' Organised by 'The Society of Agricultural Professionals, Kanpur, Oct to Nov. 01, Abs: 8.2.23 (134), 2010.
17. Tewari N, Singh P, Kanaujia VP. Seed vigour assessment in onion (*Allium cepa* L.). 11th National Seed Seminar on Quality Seed to Enhance Agriculture Profitability at Uni. Of Agri. Sci. Dharwad. 2002;217:18-20.
18. Tripathi DK. Studies on seed vigour test and their relationship to field emergence in green gram (*Vigna radiate* L.) Wilezek. Thesis submitted in CSAUAU, Kanpur; c2011.