



## Study on Seed Vigour And Their Correlation to Field Emergence in Groundnut (*Arachis Hypogaea* L.) Genotypes

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### ABSTRACT

Studies were carried out on seed vigour and their correlation with field emergence of six groundnut genotypes. Highly significant differences were observed, from the investigation it was found that for predicting the field emergence in groundnut, lab tests like first count of germination, accelerated ageing test of 12 hrs and EC test should be used. Apart from these, two other tests like seed density and final count of germination can also be adopted.

### KEYWORDS

Groundnut, vigour, field emergence

Groundnut (*Arachis hypogaea* L.) is the king of oilseed crops containing 48 percent edible oil and 25 per cent high quality protein. Being a legume, it occupies a unique position in the farming system. It is the world's fourth most important source of edible oil and third most important source of vegetable protein. It is cultivated in 100 countries located between 40 °N and 40 °S with a world production of 35.9 million tonnes and area of 25.2 million hectare with a productivity of 1.42 tonnes per hectare (Anon., 2005). In India, groundnut is grown mainly during rainy season. The principal groundnut growing states are Gujrat, Andhra Pradesh, Karnataka, Tamilnadu and Maharashtra which accounts for an area of 80%.

Seed vigour is a very important character in groundnut and must be high during planting so that the seed can resist the many environmental factor effecting germination and field establishment. A greater understanding of the appropriate method for determination seed vigour in ground nut helps to improve the crop stand and yield. It is also important to appreciate how to vigour test were derived and their limitation so that in the future, even better method may be used to predict field emergence more effectively (Siva Subramanian and Ram Krishnan, 1974). Germination potential of seed is associated with seedling vigour (Maurya et al. 2006).

### MATERIALS AND METHODS

The following tests were employed to determine the seed vigour and assessment of field emergence in freshly harvested seeds of groundnut six varieties kaushal, utkarsh, prakash, chitra, amber and TG37A. The experiment work was conducted in the seed testing laboratory of the Department of Seed Science and Technology, Chandra Sekhar Azad University of Agriculture and Technology, Kanpur. The following tests were employed to determine the seed vigour and assessment of field emergence in varieties of groundnut.

#### Assessment of vigour and Co-relation to field emergence

##### (a). Physical Test

1. Test weight (g)
2. Seed Volume (cc)
3. Seed Density (g/cc)

##### (b). Physiological test

1. First Count (%)
2. Final Count (%)

3. Seedling length (cm)
4. Vigour Index - I (Germination x Dry weight)
5. Vigour Index-II (Germination x seed length)
6. Seedling dry weight (g)
7. Accelerated ageing test 12 hours (%)
8. Accelerated ageing test 24 hours (%)

##### (c). Biochemical test

1. Tetrazolium test (%)
2. Membrane integrity test (dSm<sup>-1</sup>)

##### (d) Field emergence of seedling (%) (after 15 days of sowing)

All the values are given in the table-1. Meteorological data on temperature and relative humidity was recorded which ranged from 19.5 to 37.7°C and 89.4 to 61.5 per cent respectively during January 2011 to april 2012.

### RESULTS AND DISCUSSION

The germination test is inadequate for prediction of field stand primarily due to the fact that the germination test in laboratory is carried out under very ideal conditions which seldom meets in the field (Agrawal, 1975). Quite a large number of tests have been advocated to evaluate field stand potential of the seed. These tests have been commonly referred as vigour tests (Baskin, 1970). A vigour test is not a test for field response per se. The field response of strain may more closely be correlated with vigour test or the ordinary laboratory test, depending upon the nature of field condition under which seed is sown (Jagdish and Shambulin gappa, 1963).

The analysis of present study involving various statistically tools. Vigour tests like test weight, seed volume, seed density, first count, final count, root length, shoot length, vigour index-I, vigour index-II, seedling dry weight, accelerated ageing test for 12 hrs and 24 hrs tetrazolium test electrical conductivity test and field emergence (table 1) revealed that the varieties differed significantly, for all above mentioned tests. The difference occurred in varieties was genetic. The salient findings of the present investigation are as under.

Test weight was taken in all six genotypes of groundnut in which Prakash genotype showed highest test weight (606.9g). The correlation between test weight and field emergence was

found non significant but positive (Katiyar, *et al.* 1990).

Seed volume of genotypes in laboratory showed significant differences among varieties. Highest seed volume was showed by Prakash and Utkarsh with similar performance. The correlation between seed volume and field emergence was found non significant but positive (Katiyar, *et al.* 1990 and Lather *et al.*, 2010).

Genotypes were significantly different to each other in seed density parameter. Highest density was showed by TG37A and the correlation between seed density and field emergence was significant and positive this test can be used to assess the field emergence. This finding is in agreement with *Katiyar, et al.* (1990) in soybean, lather *et al.* (2010) in cotton.

First count of all genotypes (Kaushal, Utkarsh, Prakash, Chitra, Amber and TG37A) counted on fifth day of seed germination revealed that the variety differed significantly. The maximum germination per cent in first count was showed by TG37A and the correlation between first count and field emergence was found highly significant and positive (Tekrony and Elgi (1977) in Soybean and Lather *et al.*, (2010) in cotton.

Final count of all genotypes of groundnut was taken on 10<sup>th</sup> day. Maximum value of percent in final count of germination was recorded in Utkarsh. It mean normal and healthy seedlings were maximum in Utkarsh that's why it showed highest emergence in field also. This genotype was also showed the maximum test weight among the genotypes. It showed that maximum available food material to germinating seeds also played an important role in germination in lab as well as in field. The correlation between final count and field emergence was positive and significant. Contradictory to above Larsen *et al.*, (1998) reported in rapeseed.

The root length of six genotypes of groundnut was also significantly different. The maximum root length was found in Kaushal. Root length is mostly governed by the reserved food material present in the seed and the action of growth promoters like gibberelic acid and cytokinins. The correlation between root length and field emergence was not significant but very low in value. (Tekrony and Elgi 1977), Chandgi Ram and Onkar Singh (1988), Gangwar, *et al.* (1988), Katiyar *et al* (1990).

The six genotypes of groundnut showed significant difference regarding to shoot length. The best performance regarding to shoot length was showed by Kaushal, this genotype was also showed high value in root length, vigour index-II and accelerated ageing test for 12 hrs and field emergence (Yaklich and Kulik 1979) and Chhabra and Ram (1988), Katiyar, *et al.*, (1990).

Vigour index-I and dry weight of seedlings showed significant differences among the varieties. The highest vigour Index-I and dry weight were showed by Utkarsh and Prakash with similar performance. The correlation of vigour index-I and dry weight with field emergence was positive (Katiyar *et al.* 1990 and Lather *et al.*, 2010) but non significant. So these two lab vigour test can not be used to predict field emergence of

groundnut.

Vigour Index-II showed significant difference among the genotypes of groundnut. The highest vigour-II was showed by Kaushal. The correlation between vigour Index-II and field emergence was positive (Katiyar, *et al.* 1990 and Lather *et al.* 2010) but non significant.

The six genotypes of groundnut (Kaushal, Utkarsh, Prakash, Chitra, Amber and TG37A) showed significantly difference regarding to seedling dry weight. The maximum dry weight was reported in Prakash and Utkarsh with similar performance. The correlation between seedling dry weight and field emergence was positive (Lather *et al.* 2010 in cotton) but non significant.

In accelerated aging test for 12 hrs and 24 hrs, the highest germination percent was exhibited by Kaushal, Utkarsh, Chitra and TG 37A with similar performance for 12 hrs. And for 24 hrs the highest germination percent was showed by Prakash, TG37A, Chitra and Amber with similar performance. The correlation with accelerated aging test of 12 hrs with field emergence was positive but non significant and correlation of accelerated aging test for 24 hrs with field emergence was positive and significant, (Chandgi Ram and Onkar Singh 1988), Chhabra and Ram (1988).

The six genotypes of groundnut showed significantly different to each other in tetrazolium test. The highest percent value was exhibited by Utkarsh. The correlation between tetrazolium test and field emergence was positive (Amaritsut 2004 and Yaklich *et al.* 1979) but non significant. So this test can not be used to correlate the field emergence of groundnut.

Groundnut genotypes differed significantly in electrical conductivity of seed leachate by weight. The difference occurred in varieties were due to genetic constitution of the seed. The minimum EC value was exhibited by Kaushal. The correlation between electrical conductivity test and field emergence was negative but highly significant several scientist studied the relationship of EC to field emergence.

The field emergence also exhibited significantly difference among the genotypes of groundnut. This difference was due to genetic variation of the different varieties. The highest field emergence was showed by Kaushal and TG37A with similar performance. (Makkawi *et al.* 1999).

On the basis of germination vigour test and field emergence the six genotypes of groundnut Kaushal, Utkarsh, Prakash, Chitra, Amber and TG37A were evaluated and found that genotypes Utkarsh, TG37A and Kaushal were found significantly superior in performance when they were tested in various vigour test and followed by Chitra, Prakash and Amber. It may be due to the genetic makeup of the genotypes of groundnut.

For predicting the field emergence in groundnut, lab tests like first count of germination, accelerated ageing test of 12 hrs and EC test should be used. Apart from these, two other tests like seed density and final count of germination can also be adopted(given in table 1).

**Table 1 : Statistical over all performance of genotypes of groundnut in germination and various vigour parameters**

Varieties	Test weight (g)	Seed Volume (cc)	Seed density (g/cc)	First count (%)	Final count (%)	Root length (cm)	Shoot length (%)	Vigour index		Seedling dry weight (g)	AAT 12 hrs (%)	AAT 24 hrs (%)	Tz Test (%)	Ec test (%)	Field emergence (%)
								G x Dw	G x SDL						
Kaushal (V <sub>1</sub> )	296.9	32.3	9.20	68.3	82.6	8.7	3.16	192.45	974.68	2.33	71.3	44.6	83.3	1.41	81.3
Utkarsh (V <sub>2</sub> )	518.1	69.0	7.51	54.3	90.3	4.9	2.15	487.62	623.07	5.40	71.0	44.6	97.0	1.86	78.0
Prakash (V <sub>3</sub> )	606.9	71.3	8.51	50.3	78.0	7.0	2.18	446.94	709.80	5.73	65.3	53.6	85.0	1.72	75.0
Chitra (V <sub>4</sub> )	396.2	44.6	8.28	70.3	78.3	5.2	2.43	323.37	595.08	4.13	69.0	52.6	83.3	1.42	79.0
Amber (V <sub>5</sub> )	321.0	42.0	7.66	48.6	73.3	6.6	2.4	272.67	659.7	3.72	66.0	52.3	90.3	2.14	71.6

Varieties	Test weight (g)	Seed Volume (cc)	Seed density (g/cc)	First count (%)	Final count (%)	Root length (cm)	Shoot length (%)	Vigour index		Seedling dry weight (g)	AAT 12 hrs (%)	AAT 24 hrs (%)	Tz Test (%)	Ec test (%)	Field emergence (%)
								G x Dw	G x SDL						
TG37A (V <sub>e</sub> )	417.3	41.3	10.10	79.3	86.3	4.9	2.1	327.94	604.1	3.80	68.0	53.6	90.3	1.46	80.0
Mean	421.56	50.08	8.54	61.85	81.46	6.21	2.4	342.42	699.46	4.18	68.43	50.21	88.2	1.67	77.48
C.D. (P=0.05)	18.6	3.65	0.80	3.06	2.11	1.11	0.55	90.27	112.64	0.96	2.24	1.76	2.59	0.031	1.21
Correlation 'r'	0.1787	0.3245	0.615*	0.8208**	0.6574**	0.0095	0.3686	0.2071	0.3191	0.3876	0.7642**	0.4185	0.2149	-0.889	

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