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Study of Seed Quality Parameters in Stored Wheat (*Triticum Aestivum L.)* Seed

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***Abstract*—The laboratory Experiment entitled entitled "Study of seed Quality parameters in stored wheat (Triticum aestivum L.) Seed" was carried out in the seed testing laboratory, department of Genetics and plant Breeding, Sam Higginbottom institute of Agriculture Technology & science, Allahabad. The objective of the present study was to assess physical, viability and vigoure parameter in wheat seeds. Analysis of variance reveals that presence of considerable variation among the varieties for all character viz. Seed test weight(g), germination %, speed of Germination (days-1), Root length(cm), Shoot length(cm), Seedling length(cm), Seedling fresh weight(g), Seedling dry weight(g), Vigour index length, Vigour index mass, and seed viability test (TZ test). On the basis of mean performance for physical parameters best variety was observed by HD-262 has been identified as the best variety for the seed quality parameters viz, Seed test weight, germination %, speed of Germination, Root length, Shoot length, Seedling length, Seedling fresh weight, Seedling dry weight, Vigour index length, Vigour index mass, and seed viability test (TZ test).**

***Index Terms*—Wheat, Seed vigour, seed viability, Germination and storage**

I. Introduction

Botanically wheat belong to the family Germaine and known with the name of Triticum aestivum L.(chromosome number 2n=42). Wheat (Triticum aestivum L.) the versatile cereal food is also described as the stuff of life. It continues to retain this pride of place with its roots ramifying into the depths of human culture with evolutionary history parallel with the human civilization itself. Even today, it occupies primary position among all the cereal crops due to its feeding bowl to mankind. It is estimated that more than 35 per cent of the world population depends on wheat (Bourlaug, 1968 and Johnson et. al., 1978) as it supplies more nutrients particularly essential amino acids than any other single crop (Ranum et. al., 1990). Wheat is cultivated over a wide range of climatic conditions and therefore understanding of genetics is of great value for genetics and plant breeding purposes.

Globally, India is the second largest producer next to China with maximum area under wheat. However, in terms of productivity, it ranked thirteenth and marginally less relative to world average. Analysis on year-to-year growth indicated that the overall production in the country has increased by 2.57 per cent. Though acreage increase is the major reason for the historic production, yield in traditional and large wheat growing states like Punjab, Haryana and Madhya Pradesh have shown a rise which is a good sign for the central grain pool. State wise analysis indicated that Uttar Pradesh has registered the highest production (30.24 million tonnes), followed by Punjab (17.04 million tonnes), Madhya Pradesh (13.93 million tonnes) and Haryana (11.80 million tonnes). These top six states together contributed around 91 per cent of the total wheat production in the country. Among states, Madhya Pradesh alone produced additional 7.94 lakh tonnes (6.05 %) wheat in 2013-14 followed by Gujarat and Haryana. Despite increased acreage, production in Uttar Pradesh witnessed a fall by 0.6 lakh tonnes which is mainly due to the decline in yield. State wise analysis on acreage indicated that Uttar Pradesh holds the prime position (9.96 million hectares), followed by Madhya Pradesh (5.79 million hectares), Punjab (3.51 million hectares), Rajasthan (2.81 million hectares), Haryana (2.50 million hectares) and Bihar (2.26 million hectares). All these states together cover about 86 per cent of the total area in the country under wheat (Wheat Scenario, 2014). During 2013-14 and 2014-15, the world production increased by 1 per cent (from 714 million MT to 720 million MT) and world trade decreased by 1.28 per cent, (from 156 million MT to 153 million MT), respectively (Commodity Profile for Wheat, 2016). India's share in global exports was around 1.8 per cent in the year 2014-15.Quality of seed is multiple concepts comprising several aspects such as Genetic purity, physical purity, high level of germination and vigour and free from disease insects etc. Seed vigour is not equivalent of seed germinability. vigour is define by ISTA as the sum total of those properties of seed which determine the potential level of activities and performance of a non-dormant seed (Perry 1972) thus germination tests which are conducted under optimum condition in the laboratory can only indicate the ability of a seed lot, established seedling

Under favourable conditions. Quality of seed is influenced by kind of crop management practices, storage conditions apart from physical, biochemical and physiological factors of seeds (Doijoide, 1988). Among these factors, storage condition plays

a major role as it is associated with attack of storage pests and diseases under variable influences of temperature, relative humidity and seed moisture. Prevalence of fluctuating storage conditions not only cause significant deterioration in seeds but also make them useless for sowing in subsequent seasons. Vigour and quality of seeds in storage for longer period by controlling insect pests at both pre- and post-harvest periods.

Germination is the growth of plant contained within a seed; it results in the formation of the seedling. Seed germination depends on both internal and external condition. The most important internal factors include temperature, water, oxygen, and sometimes light or darkness (Raven et al. 2005).

Early seedling vigour, speed of germination and dry matter production per plant were observed with decline in germination in germination level in rice (Backendam and Grab 1979).

Minimum limit of seed vigour can only be imposed in seed enforcement, if we can get a test by which, we can establish the real value of seed lot. High variation and low reproducibility among seed vigour test cause hindrance to the reliability of vigour test. Vigour testing for different crop species and regions has not achieved the same level of standardization possessed by the standard germination test. The seed vigour concept developed on the basis of the observation of genotypes of lots with similar viability performed differently under stress condition (Delouche and Baskin, 1973). A vigour test assesses, either directly or indirectly, the physiological and physical basis of potential seed lot performance and provides a more sensitive differentiation among seed lots than does the standard germination test. Although seed vigour tests are widely used by the seed industry and are now offered by Two-thirds of ISTA seed testing laboratories, vigour testing was only recently approved for inclusion in the ISTA rules for seed testing. It will define the role of seed testing laboratories and the seed industry in the acceptance of seed vigour as a valuable test of physiological seed Quality (Tekrony, 2003)Seed quality refers to seed with high germination percentage seed vigour and seed must be viable. Seed quality will be better when the physical quality parameter of seed like test weight, Germination percentage (%), Root length, shoot length, seedling length, seed vigour parameter like seed density, speed of germination, vigour index length, vigour index mass, seed metabolic efficiency, seed vigour could match the standard value. These parameters must be standard.

II. Material and Methods

The experiment was carried out in the laboratory of the Department of Genetics and Plant Breeding, Sam Higginbottom university of Agriculture, Technology and Sciences, Allahabad. The University is located on the bank of Yamuna River. This region has a subtropical climate with extreme summer and winter both. During winter season especially in the month of December and January, the temperature drops down as low as 2-3°C, while during summer the temperature reaches up to 40-460C. During winter frost and during summer scorching winds (known as loo) are common features. The average rainfall in this area is around 1013.40 mm with maximum concentration during July-September with few occasional light showers and drizzles in the winter also.

The experimental material consist of fourteen variety of wheat, which were collected from Directorate of seed and farm (SHUATS) and local farmer of district satna (M.P) and stored 6 month in gunny bag. The objective of the present study was to assess physical, viability and vigoure parameter in wheat seeds. Analysis of variance reveals that presence of considerable variation among the varieties for all character viz. Seed test weight(g), germination %, speed of Germination (days-1), Root length(cm), Shoot length(cm), Seedling length(cm), Seedling fresh weight(g), Seedling dry weight(g), Vigour index length, Vigour index mass, and seed viability test (TZ test).The laboratory experiment was conducted to evaluate fourteen variety of wheat in completely randomized design with three replication. The data were statistically analysed using ANOVA.

III. Results and Discussion

The present investigation was carried out to assess seed quality 1n 14 variety of wheat under laboratory conditions. The test weight ranged from 45.13 to 47.01 with grand mean value 44.72 the maximum test weight was depicted by variety HD-262(47.01) followed by kuber(46.39) and sharbati(46.31). Whereas the minimum test weight was depicted by variety sujata(45.29) followed by HD-306 (45.39) and K-9451(45.42). Hewston(1964) found that many vegetable species almost in variably produce larger seedling when grown larger seeds and there was close relationship between seed weight this may be due to the greater amount of food reserve contained and the greater embryo size or both (Wood et al.1977) sahoo 2009 reported similar results. The similar results were obtained bt Wester and Roy (1983) and Wester(1964) in limea bean.

The Germination percentage ranged from 65.33 to 97% with Grand Mean 89.44%. The maximum Germination Percentage was exhibited by variety HD-263 (97.00%) Followed by Sharbati (94.33%) HD-306 (93.67) and Kuber (93.00%). Whereas minimum Germination percentage was depicted by variety Sujata (65.33%) Lokman (87.67%) and DP-650 (89.33%) which was statistically at par with each other. All Genotypes was showed significant different to over Sujata, Lokman, and DP-650.Higher germination of Large Seed could be attributed to the higher initial capital which conferred initial advantage. Wood et Al. (1977) Reportedly that the bigger sized seeds passes well developed embryo which could be the cause for greater seed viability against smaller seed. It is an agreement with the finding of Dronawall (1985).

Speed of germination significant differences across the varieties a range of 14.91 to 16.52 the highest value of speed of germination was observed in HD-263 which was

TABLE I
MEANS PERFORMANCE OF 14 VARIETIES OF WHEAT

S. No.	Entries	Test weight (g)	Germination (%)	Root length (cm)	Shoot Length (cm)	Seedling Length (cm)	Speed of Germination	Seedling fresh weight (g)	Seedling dry weight (g)	Vigour index length (cm)	Vigour index mass (g)	Seed viability (TZ test
1.	DP-650	46.23	89.33	11.17	8.00	19.17	15.10	1.66	0.61	1712.04	54.80	88.33
2.	lokman	45.85	87.67	12.21	8.66	20.81	15.67	1.45	0.48	1873.08	42.07	86.67
3.	kanchan	46.08	90.00	10.71	8.76	19.47	15.55	1.47	0.42	1752.25	38.09	89.67
4.	HD-262	47.01	97.00	13.40	9.16	22.56	16.29	2.47	0.62	2140.02	60.48	96.33
5.	Sujata	45.29	91.00	8.78	8.85	17.73	15.38	1.81	0.38	1613.50	34.28	85.33
6.	Sharbati	46.31	94.33	12.65	8.68	21.33	16.03	2.10	0.56	2011.82	53.15	93.33
7.	MD-vijeta	45.13	82.67	13.38	6.86	20.24	14.42	1.65	0.50	1322.50	32.87	76.67
8.	Kuber	46.39	93.00	12.51	7.84	19.97	15.81	2.13	0.51	1857.50	47.45	89.67
9.	HVW-234	45.61	90.67	11.57	8.00	20.52	14.94	1.94	0.43	1878.65	39.30	89.67
10	PVW-154	46.07	88.67	12.13	8.33	19.90	14.86	1.70	0.54	1739.30	47.90	89.33
11.	HD-260	46.33	89.67	11.35	7.54	18.89	15.91	1.29	0.47	1693.63	42.14	89.00
12	HD-306	45.39	93.67	10.37	7.98	18.34	14.97	2.07	0.54	1718.25	50.28	91.33
13	K-9451	45.42	85.00	12.45	8.27	20.72	15.19	1.88	0.58	1844.30	51.92	89.00
14	HD-3086	46.23	89.67	11.68	7.81	19.48	15.50	1.62	0.49	1714.55	42.83	88.00
Gm		45.95	90.17	11.74	8.20	19.94	15.53	1.84	0.51	1776.05	45.23	88.74
maximum		47.01	97.00	13.40	9.16	22.56	16.29	2.47	0.62	2140.02	60.48	96.33
minimum		45.13	82.67	8.78	6.86	17.73	14.42	1.29	0.38	1322.50	32.87	76.67
CV		16.904	2.349	2.490	1.086	1.572	0.564	18.603	4.139	95.003	5.317	1.830
CD-5%		0.232	3.631	0.458	0.139	0.489	0.239	0.151	0.033	94.207	3.933	2.707

significantly superior to all other varieties the other variety with higher speed of germination were Sujata 15.88 HD-260 15.82. The lowest value for this character was measured inMD vijeta 14.91.

Root length showed significant differences across the varieties a range of 8.78cm to 13.40cm the highest value of Root length was observed in HD-263 which was significantly superior to all other varieties the other variety with higher root length were MD Vijeta 13.38cm sharbati 12.65cm. The lowest value for this character was measured in sujata 8.78cm, HD-306 10.37cm and kanchan 10.71cm. The overall mean for the root length of various varieties is 11.69cm.

Shoot length ranged from 6.86 cm to 9.16 cm with grand mean value of 8.20cm. The maximum Shoot length was observed in the variety HD-262 (9.16) followed by the variety sujata (8.85 cm) and sharbati (8.86 cm). Whereas the minimum shoot length was observed in the variety MD-vijeta(6.86) folloed by HD-262 (7.54 cm) and HD-3086 (7.81cm).

Root length and shoot length increased with increased in the seed weight, this may be due to greater amount of food reserve contained and the greater embryo size or both.

The Seedling length is associated with earliness of the variety in Respect of emergence, plant growth, and potential. In this investigation the genotype exhibited a wide range of seedling length (17.73cm to 22.56cm) with significant differences. The maximum and significantly higher seedling length was observed for HD-206 22.56cm followed by sharbati 21.33 and Lokman 20.81cm. The minimum value of seedling length was noted in sujata 17.73cm.the general mean for this trait was 19.91cm

The mean performance of the genotype for seedling vigour index length varied significantly and ranged from 1613.50 to 2140.02cm. The highest value of vigour index length was observed in HD-262 (2140.02cm) followed by sharbati (2011.82cm) and Lokman (1873.08cm). The minimum value of vigour index length was recorded in sujata (1613.50) followed by MD-vijeta (1673.75cm) and HD-260(1693.63cm). The general mean for this trait is1776.05cm.Germination% and seedling length were the major factor for deciding the vigour index length. All twelve varieties of wheat showed significant and wide range of variability seedling vigour index mass from32.87g to 60.48g. The highest value of seedling vigour index mass was recorded in HD-262 60.48g followed by DP-650 54.80g and sharbati 53.15g.the lowest value was observed in sujata (34.28) followed by kanchan (38.09) and MD-vijeta (41.63). The overall mean of varieties for this character is 45.25 (g).

The seed viability ranged from 76.67 to 96.33 with grand mean value 88.78. The maximum seed viability was exhibited by variety HD-262(96.33) which was statistically at par with each variety. Whereas the minimum seed viability was exhibited by MD-vijeta (76.67) followed by lokman (86.67) and DP- 650 (88.33).The loss of seed vigour and viability has been associated with the deterioration of membrane integrity (Takayangi and Murakami, 1968).

IV. CONCLUSION

On the basis of mean performance, the variety HD-262 has identified as the best variety for the seed quality parameter viz, Seed test weight, germination %, speed of Germination, Root length, Shoot length, Seedling length, Seedling fresh weight, Seedling dry weight, Vigour index length, Vigour index mass, and seed viability test (TZ test).

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