

Seed Yield and Quality of Wheat (*Triticum aestivum*) Cultivars as Affected by Lodging

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Untimely heavy and incessant rains accompanied by hailstorm at maturity in wheat cause wide spread lodging of the crop resulting in reduction in seed yield and its quality. Prolonged rains cause sprouting and moulds in seed resulting in quantitative and qualitative loss. There is great relevance of seed germinability and seed vigour for initial assessment of crop productivity. Bread wheat is susceptible to sprouting during prolonged period of rainfall at maturity that adversely affects seed quality in terms of germination and vigour [1]. Rain damage simulation studies and genotypic differences for sensitivity to rain damage in wheat is well documented [2]. There is hardly any report on the effect of natural rains and hails on wheat seed yield and quality, hence present study was undertaken to determine the effect of lodging due to rains and hailstorm on seed yield and quality of five wheat cultivars.

In the month of March and April 1998, continuous rains and hailstorm due to western disturbances resulted in widespread lodging of wheat varieties in Haryana. In the breeder seed plots of five cultivars of wheat (HD 2189, HD 2329, DL 803-3, HS 240 and HS 295) 4.5x10 meter plots were randomly selected at four places in each variety under lodged and unlodged conditions. The plot seed yield was recorded and converted into q/ha. 1000 seed were counted and weighed in all the replications. The seeds retained on 5.40mm screen were collected separately to determine the seed recovery. Per cent germination was determined following ISTA rules [3]. Randomly, ten seedlings were selected and their shoot and root length were added to compute seedling length. Seedling vigour was calculated as per Abdul-Baki and Anderson [4]. Data was statistically analyzed in factorial RBD [5].

The seed yield of different cultivars was significantly affected due to lodging. On an average there was reduction of 35% in seed yield under lodged condition compared to standing crop. The genotypic variation in seed yield due to lodging did exist. Variety HD 2329 showed better resistance to lodging compared to other cultivars, it also maintained its superiority even in unlodged conditions. Pandey *et al* [6] reported that translocation of photosynthates was affected due to lodging which resulted in lower number of grain and seed weight per spike leading to low yield.

Lodging resulted into significant reduction in seed quality parameters viz. 1000 seed weight, per cent recovery of seed, per cent germination, seedling length and seedling vigour (Table 1). Under lodged conditions, poor translocation of synthates to developing seeds resulted into small and shrivelled seeds with poor test weight which in turn affected the per cent seed recovery adversely. Significant genotypic differences were observed for per cent recovery (Table 1). Cultivar HD 2329 showed highest recovery under both lodged and unlodged conditions where as HS 240 showed the lowest recovery under lodged conditions. Per cent germination was significantly reduced under lodged conditions compared to standing crop. The per cent germination under lodged conditions was less than the minimum seed certification standard (85%), however, the interaction was not significant. Seed produced under lodged conditions recorded significantly lower seedling length compared to standing crop. Poor test weight in lodged conditions which is indicative of reserve food supply for seedling to meet the requirement of food material at the time of germination, could not give a vigorous

Table 1. Effect of lodging on seed yield and quality of wheat cultivars.

Cultivar	Seed Yield (q/ha)			1000 Seed Weight (g)			Recovery Percentage		
	unlodged	lodged	mean	unlodged	lodged	mean	unlodged	lodged	mean
HD 2189	53.06	44.0	48.53	44.43	31.58	38.00	92.50	77.43	84.96
HD 2329	65.53	56.93	61.23	42.41	40.07	41.24	95.67	82.57	89.12
DL 803-3	57.43	33.33	45.38	34.47	27.25	30.86	86.25	56.83	71.54
HS 240	61.33	29.73	45.53	34.77	23.69	29.23	91.27	41.79	66.57
HS 295	43.73	18.66	35.20	32.93	29.83	31.38	84.95	67.01	75.98
Mean	56.20	36.53		37.80	30.49		90.13	65.12	
CD (P=0.05)									
Cultivar	8.59			2.80			8.97		
Lodging	5.43			1.77			5.67		
Interaction	12.16			3.96			12.69		

Cultivar	Germination Per cent			Seedling Length (cm)			Vigour Index		
	unlodged	lodged	mean	unlodged	lodged	mean	unlodged	lodged	mean
HD 2189	88.50	74.00	81.25	13.30	8.40	10.85	1176.7	618.9	897.8
HD 2329	92.00	82.25	87.12	12.51	10.09	11.30	1151.9	828.9	990.4
DL 803-3	89.00	76.50	82.75	12.42	8.07	10.24	1107.6	617.8	862.7
HS 240	88.75	80.00	84.37	9.55	7.88	8.70	844.9	631.6	738.2
HS 295	92.75	75.50	84.12	13.07	8.67	10.87	1212.7	647.1	929.3
Mean	90.20	77.65		12.17	8.62		1098.8	668.8	
CD (P=0.05)									
Cultivar	3.72			0.87			60.2		
Lodging	2.35			0.55			38.1		
Interaction	NS			1.23			85.2		

start compared to higher test weight seeds under standing crop conditions. The results confirmed the earlier reports of Parkash and Singhal [7]. Higher seedling length may be ascribed to greater amount of food reserve and the greater embryo size or both [8].

Seedling vigour index was higher under standing crop conditions. HD 2329 recorded the highest seedling vigour index under lodged conditions where as lowest vigour index was recorded in HS 240 (Table 1). Seed weight is an important character associated with seedling vigour due to sufficient amount of stored food material, the bigger size seeds have higher vigour index. In the larger seed group two factors viz. easy breakdown of food material and rapid rate of translocation as well as utilization

of simpler carbon chain in shoot length elongation accounts much to show the vigour potential of seeds [9].

It is concluded from ongoing discussion that under lodging conditions due to rains and storms seed yield and quality are adversely affected. Cultivar HD2329 showed lower reduction in seed yield and quality attributes compared to other cultivars.

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