Indian J. Genet., 52 (2): 161–163 (1992)

RATE AND DURATION OF GRAIN FILLING IN WHEAT

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(Received: October 3, 1989; accepted: October 25, 1991)

ABSTRACT

Genotypes did not differ in the rate of grain filling. The rate of grain filling in early sowing was the lowest (0.62 mg/grain/day) which progressively increased in timely and late sowing. Wheat varieties differed widely in the duration of grain filling. The average duration of grain filling in early sowing was 65.3 days which progressively declined to 56 and 38.3 days in timely and late sowing, respectively. The highest rate of grain filling irrespective of the time of sowing occurred in the second fortnight of March.

Key words: *Triticum aestivum*, common wheat, rate, duration, grain filling.

The rate and duration of grain filling in wheat are considered to be important components of grain yield [1]. Duration of grain filling is limited by the ambient temperature [2, 3] and cannot be practically prolonged. The genetic differences, if any, for the rate of grain filling could, however, be useful. Little is known about the rate of grain filling of different varieties of wheat cultivated in Punjab. The present study was, therefore, planned to evaluate genotypic variation for the rate of grain filling at different stages of grain development in common wheat.

MATERIALS AND METHODS

Six varieties of common wheat, viz. Sonalika,PBW 226, HD 2285, HD 2329, PBW 222 and WL 711 were evaluated for the rate of grain filling (mg/grain/day). The experimental material was sown on three dates (early—3rd November; timely—16th November, and late—12th December) during 1988 in a split plot design with three replications. Each experimental plot was comprised of four rows each of 5 m long spaced at 23 cm apart. Seed rate of 100 kg/ha was used. Recommended package of practices for fertilizers and irrigation were followed.

One hundred spikes, at the anthesis stage from each plot, were tagged. A sample of ten tagged spikes, after every 10 days from anthesis till maturity, was collected from each plot randomly. Samples were dried at 55°C for 48 h and then threshed and dry grain weight

(mg/grain/day) was calculated. The duration of grain filling (days) was calculated from anthesis to physiological maturity when the crop turned pale yellow. Standard statistical procedures were used to analyse the data.

RESULTS AND DISCUSSION

The rate of grain filling in wheat, sown on different dates, varied significantly. The highest average rate of grain filling was 0.91 mg/grain/day under late sowing and the lowest (0.62 mg/grain/day) in early sowing (Table 1).

The rate of grain filling at different stages during grain filling also varied significantly (Table 1). The peak rate of grain filling was recorded on 40 days after anthesis in early, 30 days in timely and 20 days in late sowing. The peak period of grain filling, irrespective of the date of sowing, fell within second fortnight of March. The average temperature during the peak period of grain filling was 19°C. The range of minimum and maximum temperatures during this period were 9.5–19°C and 22.5–28.5°C, respectively, at Gurdaspur. The average photoperiod during this period was 12 h. As the highest rate of grain filling (1.25 mg/grain/day) was observed four weeks after anthesis in the timely sown crop, all efforts should, therefore, be made to sow wheat well in time.

Table 1. Rate of grain filling in common wheat at different stages of grain development under three sowing dates

Days after anthesis	Grain filling under different sowing dates (mg/grain/day)			
	early	timely	late	mean
10	0.32	0.45	0.75	0.51
20	0.81	0.86	1.11	0.93
30	0.91	1.25	0.94	1.03
40	0.93	0.73	0.53	0.81
50	0.52	0.18	—	0.35
60	0.22	0.08	—	0.20
Mean	0.62	0.67	0.91	0.70

$LSD_{0.05}$: for sowing date 0.12; for days after anthesis 0.20.

The rate of grain filling did not vary significantly in different varieties. The interactions of genotypes, sowing dates and stages of grain filling were nonsignificant. The rate of grain filling was improved under late sowing in all varieties except WL 711 which may be due to its high susceptibility to brown rust and powdery mildew.

The average duration of grain filling in early, timely and late sowing were 65.3, 56.0 and 38.3 days, respectively (Table 2). The duration of grain filling among different varieties varied widely. Sonalika had the longest duration of grain filling followed by PBW 226 and HD 2285. The cultivar WL 711 had the shortest duration of grain filling. This indicated that wheat varieties having long grain filling duration are best suited for late sowing.

Lack of genetic variation for the rate of grain filling and presence of ample variability for the duration of grain filling suggest that breeding for the duration of grain filling only would be a useful proposition for developing high yielding varieties for different sowing conditions. The varieties having long grain filling duration if sown early, they flower during early January at Gurdaspur and are prone to damage by frost. Such varieties would be useful in late sowing only. Efforts should continue to screen large germplasm of wheat to isolate genotypes for high rate of grain filling for appropriate combination with genotypes differing in grain filling duration.

Table 2. Grain filling period of different wheat varieties sown on different dates

Variety	Grain filling period (days) under different sowing dates		
	early	timely	late
Sonalika	69	60	41
PBW 226	69	58	39
HD 2285	67	58	39
HD 2329	61	55	38
PBW 222	66	56	37
WL 711	60	50	36
Mean ± SE	65.3 ± 1.6	56 ± 1.4	38.3 ± 0.7

REFERENCES

1. P. L. Bruckner and R. C. Frohberg. 1987. Rate and duration of grain filling in spring wheat. Crop Sci., 27: 451–455.

2. I. Safield, L. T. Evans, M. G. Cook and I. A. Wardlaw. 1977. Factors influencing the rate and duration of grain filling in wheat. Aust. J. Plant Physiol., 4: 785–797.

3. C. L. Wiegand and J. A. Cuellar. 1981. Duration of grain filling and kernel weight of wheat as affected by temperature. Crop Sci., 21: 95–101.