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GENETIC VARIABILITY FOR ANTHER LENGTH, POLLEN PRODUCTION AND ANTHER EXTRUSION IN FOUR EXOTIC LINES OF WHEAT (*TRITICUM AESTIVUM* L.)

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ABSTRACT

A good pollinator for hybrid wheat production should possess high pollen productivity and ability to extrude anthers in addition to favourable combining ability and fertility restoration properties. Anther length, efficiency of pollen production, and intensity of anther extrusion were studied in four exotic restorer lines of spring wheat. The lines significantly differed in size of anthers, number of pollen grains/anther and per cent of anther extruded. Correlation coefficient between anther length and number of pollen grains/anther was significant ($r = 0.97$), while nonsignificant negative correlation ($r = -0.05$) was observed between anther length and anther extrusion percentage. The knowledge that genotypes with large anthers also produce many pollen grains per anther facilitates the selection of a high pollen donor.

Key words: *Triticum aestivum*, pollen production, anther length.

The discovery of male sterility in wheat has offered prospects for production of hybrid wheat seed on commercial scale. However, low seed set on the male sterile plants exposed to free pollination is a major block in the realization of this objective. This problem has many aspects, such as, height of the male sterile parent in relation to the pollinator (a shorter ms line might be more favourable), range of pollen transport, width of the male sterile strip in relation to the pollinator strip on the hybrid seed production field, and synchronization of the flowering periods of male sterile and pollinator lines. Devries [1] reviewed the floral biology of wheat in relation to hybrid seed production with emphasis on the problems of cross-pollination and cross-fertilization.

The questions asked in this investigation are: (a) Is there any varietal difference in pollen production per anther? (b) Is there any positive correlation between anther length and pollen production per anther? (c) Is there any correlation between anther length and anther extrusion? If yes, then selection for a larger anther would be useful in selecting a good pollinator for hybrid wheat seed production.

MATERIALS AND METHODS

The material for the present investigation consisted of four exotic restorer lines of spring wheat: W 8156, 3401/478466, PE/YQ and R3-401. These lines were grown in RBD with three replications at the R. B. S. College Research Farm, Bichpuri. Row length was 3 m whereas row-to-row and plant-to-plant distance was kept at 30 and 10 cm, respectively. To determine anther length and number of pollen grains/anther, 30 anthers of each line were analysed by the method suggested by Devries [2]. To calculate the extrusion percentage of anthers, the following formula adopted by Milohnic et al. [3] was used:

$$\text{Extrusion \%} = 1 - \frac{\Sigma \text{ Unextruded anthers/20 heads}}{3 \times \text{fertile florets/20 heads}} \times 100$$

RESULTS AND DISCUSSION

The data on mean performance of different restorer lines for anther length, pollen grains/anther, and anther extrusion are presented in Table 1.

Anther length: Significant differences in anther length were recorded for different restorer lines. The smallest anthers were those of W 8156 (4.40 mm) and biggest of R3-401 (4.78 mm).

Number of pollen grains/anther: The lines significantly varied in the number of pollen grains/anther. The lowest number of pollen grains/anther was recorded in the line W 8156 and the highest in R3-401. The lines with larger anthers also had more pollen grains/anther. The positive correlation (r = 0.97) between anther length and number of pollen grains/anther was statistically significant.

Table 1. Mean performance of different restorer lines for anther size, pollen grains/anther, and anther extrusion

Restorer line	Anther length (mm)	Pollen grains/ anther	Anther extrusion (%)
W 8156	4.40	5202	57.0
3401/478466	4.62	5367	55.8
PE/YQ	4.63	5429	76.0
R3-401	4.78	5577	47.5

Correlation coefficients for:
(i) Anther length and No. of pollen grains/anther r = 0.97**
(ii) Anther length and anther extrusion r = –0.05

**Significant at P = 0.01.

Anther extrusion: The lines also differed considerably in the percentage of anthers extruded. Line R3-401 had the lowest (47.5) and PE/YQ had the highest (76.0) percentage of anther extrusion. The varieties with higher percentage of anther extrusion are also likely to be better pollinators. But the correlation coefficient between anther length and percentage of anther extrusion was negative, although nonsignificant (r = –0.05).

Significant differences in anther length, number of pollen grains/anther, and anther extrusion percentage in the four exotic lines indicate that selection for these characteristics is possible. No relationship was observed between anther length and extrusion percentage but it was established that a larger anther also produces more pollen grains. This information might be useful for selecting favourable pollinators and in synchronizing the flowering of parental pairs for hybrid seed production.

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