A PRILIMINARY STUDY ON THE WHITE POLLEN MUTATION IN SUNFLOWER (*Helianthus annuus* (L.))

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ABSTRACT

Sunflower plants normally produce yellow pollen. In 1989 we found 4 white pollen plants in sunflower restorer line C8711 at the university and an experiment was made in 1990 to determine the nature of the white pollen mutation and of the inheritance. Results showed that white pollen is heritable, qualitatively inherited and ocntrolled by a pair of signle genes or a few major genes.

Keywords: Sunflower(*Helianthus annuus* (L.)), white pollen.

INTRODUCTION

Sunflower(*Helianthus annuus* (L.)) is an important oilseeds crop, which normally has yellow or yellowish pollen. White pollen color has not ever been reported in sunflower.

In late July to Early August 1989, we found 4 white pollen plants in the male-sterile restorer line C8711 grown at the Experimetal Station of Jilin Agricultural University,

Changchun, the People's Republic of China. These 4 plants were designated C8711-1, C8711-1, C8711-3 and C8711-4, respectively. Before bagging could be made, they had already been open-pollinated to certain extent, except that less open-pollination was found in C8711-4. The main purpose of this experiment is to examine the nature of white pollen mutation and the inheritance of the trait if it is heritable.

MATERIALS AND METHODS

Seeds from each of the 4 mutants were sown manually in 4 adjcent plots of 5 m rows spaced 75 cm apart on 8 May 1990 in the Experimental Station of Jilin Agricultural University, Changchun, P. R. China. After emergence, stands were hand-thinned to a unique population with plants spaced 25 cm apart within each row. Before flowering, all the individual plants were bagged to prevent open-pollination. After flowering, the numbers of both white and yellow pollen plants were recorded in each of the 4 plots.After maturity, harvest was conducted on individual plants.

RESULTS AND DISCUSSION

1. The Nature of White Pollen Mutation

Both white and yellow pollen plants were found in each of the 4 plots in Experiment 1, although the number of white pollen plants relative yellow pollen plants was quite different in C8711-4 from that in the other three. The pollen color of each

plant in all the 4 plots was either white or yellow, and the distinction was very easy to draw. No other pollen colour could be found, apart from white and yellow, in these plots. All the white pollen plants looked exactly the same as the original 4 mutants in their flower part including the amount of pollen produced by each plant. Since no continuous or intermediate variation has been found in pollen colour in these plots, we can conclude that white pollen colour is heritable, qualitatively inherited and controlled either by a pair of single genes or by a few major genes. Therefore, the white pollen mutant is a very valuable germplasm for sunflower morphology and genetic study.

2. Speculation of the Inheritance of White Pollen Colour

There were only a couple of white pollen plants in C8711-1, C8711-2 and C8711-3 plots, wherease in C8711-4, 19 white pollen plants were found (Table 1). This showed that the more the original white pollen plants had been open-pollinated, the fewer the white pollen plants relative to yellow ones could be produced in the next generation. For the inheritance of white pollen, the following assumptions can be made and tested against the data in Table 1:

Assumption 1: White pollen is controlled by dorminant gene(s). According to this, there would have been no less white pollen plants than the yellow ones. But the result of Table 1 contradicts it, and hence this assumption is rejected.

Assumption 2: White pollen is controlled by recessive gene(s).

According to this assumption, there would have been more yellow pollen plants than the white ones in each of the 4 plots, and there would have been more white pollen plants relative to yellow ones in C8711-4 plot than in the other three in 1990, because of the difference in open-pollination in 1989. The result of Table 1 is in accordance with this assumption. Therefore, white pollen is probably controlled by recessive gene(s).

Table 1. Performances of progenies derived from 4 white pollen mutants in sunflower (1990, Changchun, P. R. China)

Plot	Estimated percentage of open-pollination in 1989 (%)	Number of plants observed	Number of white pollen plants	Number of yellow pollen plants
C8711-1	90	19	2	17
C8711-2	90	17	1	16
C8711-3	90	18	2	16
C8711-4	55	48	19	29

We assume that normal yellow pollen sunflower has dorminant genes PP controlling yellow pollen. Before 1989 natural mutation had caused one of the dorminant genes P to become p controlling white pollen colour, and the genotype of the mutant was Pp. Since p was concealed by P, the white pollen

character could not be expressed until one generation of self-pollination was completed in 1989. Therfore, all the 4 white pollen plants were homozygous with genotype pp. Only when white pollen is controlled by recessive genes could the results of Table 1 be expected. Otherwise, there would have been more white pollen plants than the yellow ones in the 1990 experiment. Hence white pollen is probably controlled by a pair of single recessive genes. Since no treatment was exerted on the original C8711 restorer, white pollen must have been caused from natural mutation. According to general genetics, most natural mutation belongs to single recessive gene mutation. Hence, white pollen is probably controlled by a pair of single recessive genes. But this speculation remains to be tested through genetic mating experiment.

REFERENCES

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