

THE EFFECT OF TEMPERATURE AND MANURE
ELEMENTS ON THE FERTILITY CHANGE OF CMS LINES
AND THEIR F₁ IN RAPESEED

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ABSTRACT

The effect of different amount of manure elements for fertility of polima CMS lines and their F₁s in rape was studied through the quadratic regression orthogonal gyrating combination design in two years, and the temperature sensitive period and critical value of the fertility change in rape polima cms lines were studied through sowing by stages in four years. The results showed: ① the pol-CMS lines and their F₁ had different fertility expression with different applying amount of each manure element, extra high applying amount of N manure should reduce the sterile degree of sterile lines and the restoring degree of their F₁, but the effect of P, K and B manure was just opposite; ② the temperature sensitive period of the fertility change of pol-CMS lines was the flower bud differentiation stage about one month before squaring to squaring stage, the change of fertility had a large relationship with the mean temperature/day and the mean temperature of this period, the critical temperature of fertility change of pol-CMS lines was about mean 7-9°C/day.

Key words: rape, pol-CMS, manure, temperature sensitive stage

INTRODUCTION

A lot of experiments have proved that the sterility of polima cytoplasm male sterility lines can be affected by temperature, but, the temperature sensitive period and critical value of the low temperature sensitive sterile lines have not had a very convincing report, and the report about the effect of manure elements for the fertility of pol-CMS lines have not been found too. The paper discussed the two problems.

MATERIALS AND METHODS

Experiment 1)

The two polima CMS lines and their hybrid F₁ had been chosen to sow in one hundred pots (diameter 50 cm), the pure seeds had been used in the experiment by paired crossing between individual plants. According to the quadratic regression orthogonal gyrating combination design of four factors, the manure elements carbamide (N), NaH₂PO₄ (P), KCL

(K) and Na₂B₄O₇ · 10H₂O (B) were used for the experiment in 1991—1992 and 1992—1993, twice replications each year, the checks. consisted of four pots with no fertilizers and four pots with the most amount of the fertilizers. The amount of each manure had five applying level and was applied by four stage. The squaring period, bolting stage and the blossom of the first flower of every plant were taken notes. From the blossom time of first flower, the fertility of the flowers in bloom of main inflorescence and the two upper first order branches were observed every three days.

Experiment 2)

From 1990 to 1994, three pol—CMS lines had been used in the experiment which consisted of the summer sowing in Kunming (1890 metres above sea level) and the autumn sowing in Chongqing (200 metres above sea level) where the sterile lines were sown by seven terms (from 09/10 to 01/20 next year) each year. The investigation was just like experiment 1.

RESULTS AND ANALYSIS

Effect of manure elements)

The variance analysis showed that the difference between the treatments of either sterile lines or their F₁s was significant, which means that the different level of manure application could affect the sterile degree (S. D.) of sterile lines and restoring degree (R. D.) of the F₁s. The quadratic regression equations had been calculated by using the analytic method of the quadratic regression orthogonal gyrating combination design. Based on the equations, the theoretical values of every treatment and the frequency distribution table were calculated respectively.

Some results could be found from above analysis :

Within this experiment range, the R. D. of the F₁s should be reduced with the increase of N manure, nevertheless, if N manure was used compoundly with P and B manure, the R. D. of F₁s could be improved appropriately. Because the main effects of P and B element were positive, and the interactive effect between P and K manure was negative, the R. D. of the F₁s would be improved with increasing either of P and B. but would not be improved significantly as spreading both of them. The linear term of k manure was positive and its quadratic term was negative, these meant that the application amount of k manure should be appropriate. Among 625 simulant experiment valars, the reatments of middle or low N level and midolle or high P. K. B level would get high R. D. .

For the S. D. of sterile lines, N manure had significant negative effect; P, K and B manure had significant positive effect, their quadratic terms were significant negative values, these showed that the increase of N manure would reduce the S. D. of sterile lines, while other elements must be appropriate, in a certain range increasing the three elements would improut the S. D. of sterile lines, too much they would have opposite effect. The expression of checks showed it was not beneficial to the production of cms three lines and hybrids that the spreading manure level was too high.

The temperature sensitive period)

The relationship between the sterile degree/term or the sterile degree/flower · day and the mean temperature/day, the highest temperature/day or the lowest temperature/day from 10/01 of every year to 04/15 next year had been analysed by years and by sterile lines. The results showed that the sterile degree of each sterile lines all had the highest correlation coefficient with the mean temperature/day from one month before squaring to squaring stage, which meant that the temperature sensitive period for the fertility change of pol—CMS lines was the flower bud differentiation stage, the three sterile lines had a similar result.

The critical temperature value)

The correlation analysis between the sterile degree/ term and the mean temperature of sensitive period showed that the critical temperature for fertility change of pol—CMS lines was about mean 7—9°C/day, the temperature rank of the sensitive period had some effect on fertility change too, the critical temperature value of different sterile lines had a little difference.