EFFECT OF X-RAYS ON AGRONOMIC CHARACTERS IN RICE

Mutations in Rice Induced by X-rays II

by

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The conclusion first reached by Yamada (1917) and Nakamura (1918), that X-ray treatment could improve the yield of rice, was reversed later on in Komuro's (1931) result. Saeki (1936) reported, that a certain dosages of X-rays was effective for promoting yield of rice to some extent, but the opposite was true when overdosed X-rays were applied.

The result presented here show that there are different response of seedling height but not clear cut in other quantitative characters.

Germinating seeds of Taichung No. 65 (Japonica type) which had been socked in water for three days prior to treatment were subjected to 5,000 r, 7,000 r, 8,000 r and 10,000 r dosages of X-rays at Taiwan University Hospital on Feb. 17,1954. For X-raying the seeds were placed in a single layer in a petridish located 30 cm from the tube. The radiation was filtered with ¼ mm Alminum filter and administrated at 100 KVP and 5 MA Under this condition, the seeds received approximately 260 r per minute.

Seeds were planted in green house immediately after the X-ray treatment. The seedling height was measured after 35 days and so did tiller and ear numbers in the field while length and weight of ears in laboratory after the harvest. Three ears of those with good fertility were selected for measurement of average weight and those with low fertility were excluded. The results are shown in figs. 2-7 and table 1.

Table 1. Effect of different dosages of X-rays on the agronomic characters in rice

Treatments	Average of each character						
	Seedling height (cm)	plant height (cm)	No. of tillers	No. of ears	Length of ears	Weight of ears	Total No of plant calculated
7,000 r	16.2	113.5	11.9	8.6	23.2	3.8	180
8,000 r	14.4	113.3	10.6	8.6	23.3	3.9	200
10,000 r	14.7	112.4	10.5	4.8	23.7	3.2	60
Control	16.8	114.3	11.7	8.4	23.7	3.5	50

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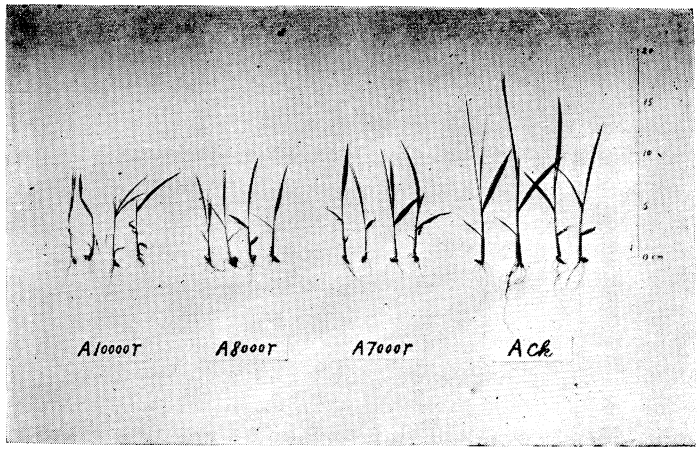


Fig. 1. Showing different dosages of X-rays effecting the seedling height.

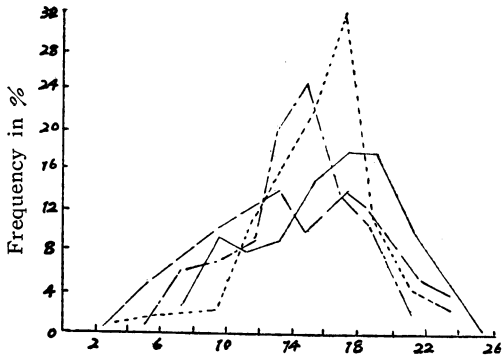


Fig. 2. Seedling height in cm.

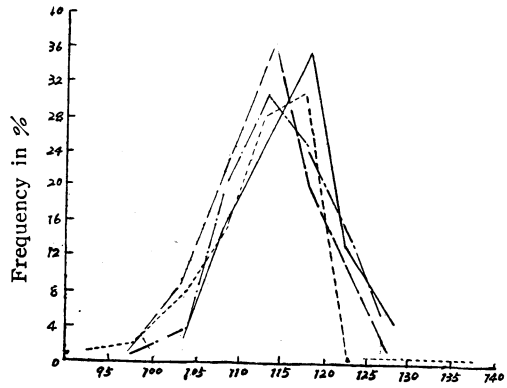


Fig. 3. Plant height in cm.

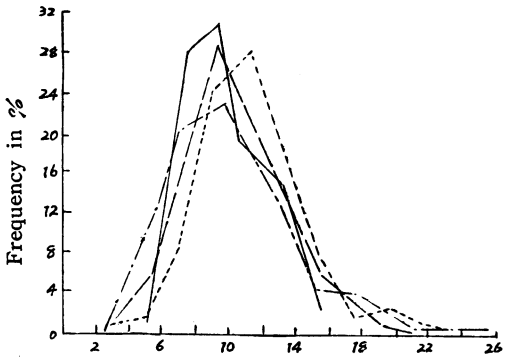


Fig. 4. Number of tillers

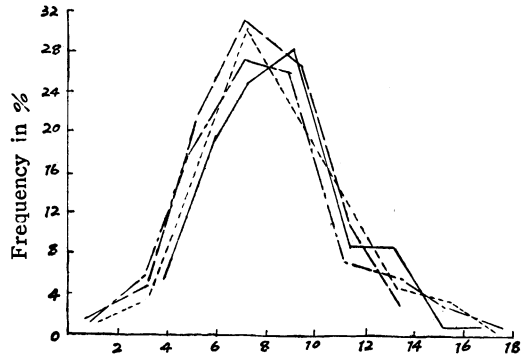


Fig. 5. Number of ears

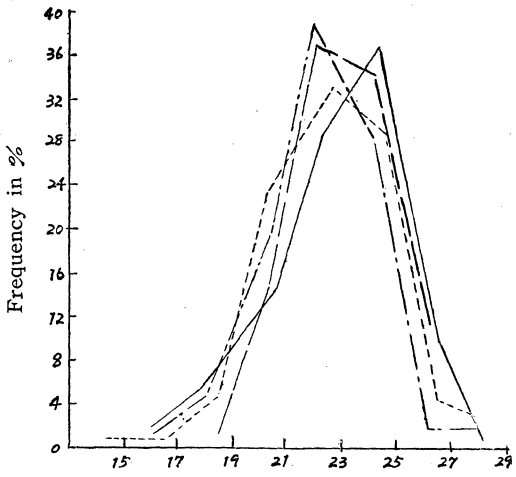


Fig. 6. Length of ears in cm.

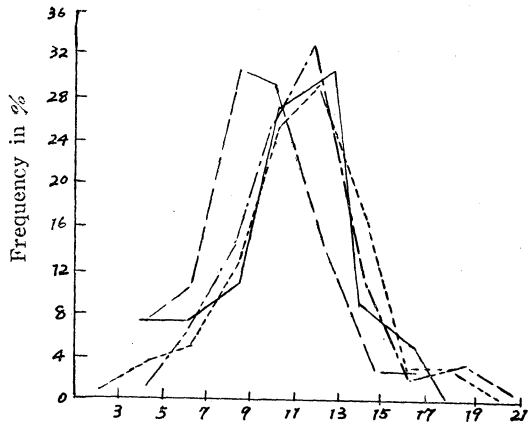


Fig. 7. Weight of ears in gr.

7,000 r
8,000 r
10,000 r
ck

Figs 2-7. Effect of different dosages of X-rays on various agronomic charachters in rice

It will be seen in Fig 1 and 2, that the degree of supression on seedling height varied according to different dosages of X-rays, and so did the speed of seedling growth. The variation ranges wide in 10,000 r treatment, being small in 7,000 r treatment. The seedling height in 7,000 r treatment, may reach the average of untreated ones, but no trace of promotion was found. It follows that there is no effect to promote plant height with more than 7,000 r of X-rays.

As described before, seedling height was differently affected by the different dosages of X-rays, but the difference was gradually reduced following the later growth. Up to the mature stage, plant height reached to that of untreated ones regardless of treatments. This shows that the different dosages give no striking effect to plant height in later growth in the present experiment, though the dwarf plants were found in X_1 generation in other experiments.

While being supressed in 8,000 r and 10,000 r treatments, the number of tillers in 7,000 r treatment was found to increase slightly. For the data of the number of ears which slightly increased and decreased according to the different dosages of X-rays can be found, although not very clear. Weight of ears decreased when high dose of X-rays were applied.

It will be concluded in the present study, that a certain dosage of X-rays was effective to promote or supress plant height, number of tillers, and ears. Yet the difference among treatments seemed insignificant (though statistical analysis was not

made) at the late growing stage. From this point of view, the possibility of obtaining new varieties with high yield is considered to be relatively small.

It is our present knowledge that quantitative characters are generally controlled by the so—called polygenes which are series of genes whose individual effect is smaller than the range of enviromental variation. They are considered to be of great importance in breeding. However, how the polygenes respond to irradiation seemed to have been unexplored problem.

If the present materials were bulked in the subsequent generations, mutations of so-called polygenes will bring about a symetrical increase of variability in both low and high directions as pointed by Oka (1958).

SUMMARY

The present paper describes the effect of X-rays on the agronomic characters which are generally regarded as controlled by the so-called polygenes. The seedling growth was supressed differently by the different dosages of X-rays in X_1 generation, while average of plant height, tiller and ear numbers, length and weight of ears were not much different from the control, though the range of variability was increased.

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X線對水稻農藝性狀之影響

水稻經X線處理後所發生之突然變異之第二報

謝　順　景

摘　要

臺中 65 號稻萌芽種子已如第一報所示方法以5,000 r，7,000 r，8,000 r 及 10,000 r 四種X線量處理後與對照同播於玻璃室內，35 天後移栽於田間。本試驗對於插秧前之苗高及收穫前後之株高，分蘗數，穗數，穗長，穗重等量性狀加以調查，觀察不同X線量對處理第一代各農藝性狀之影響，所得初步結果如下：

不同X線量對於苗高有抑制之影響，其程度概因X線量强者爲甚。佐伯式（1936）曾報告說，少量的X線可促進，大量則可抑制稻之生長。在目前試驗結果表示，除 7,000 r 處理區有稍提高平均苗高外，其他處理區均有抑制之現象，但此現象至收穫，前漸不顯明。X線量對穗長或穗數，穗重等性狀，並無良好影響，因此由X線處理而欲獲得產量高的系統似乎較爲困難。

一般而言，量性狀通常受所謂數量因子（Polygenes）所支配，其對變異的影響被認爲較環境因子之影響爲小。此等數量因子在育種上甚爲重要，而如何受放射線之影響一事實需繼續深加研究。本試驗初步的結果表示，經處理後之各量性狀之變異較未處理者爲大。