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イネの高蛋白突然変異
Radiation Induced Rice Mutants with High Protein Content

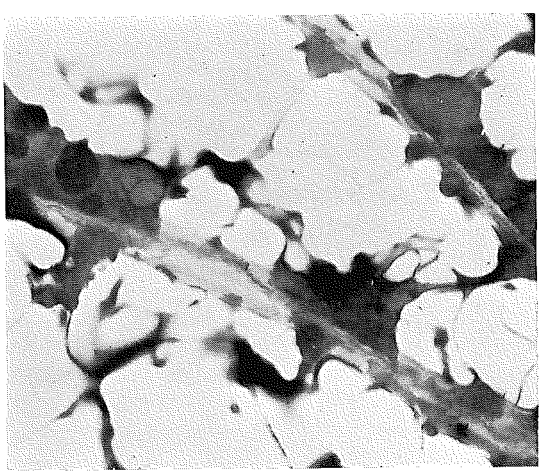
農林8号 突然変異 No. 5
Norin No. 8 Mutant No. 5
写真(1) 高蛋白早生系統 No. 5
Photo. (1) High Protein Mutant No. 5 with Early maturity

日本人は，蛋白質の摂取量が少ない上，摂取する全蛋白の約3分の1を米から補っています。米の蛋白質は穀類蛋白の中では最も良質で，リジンなど1，2のアミノ酸含有率を増すことにより肉に匹敵する栄養価を持たせることが出来ます。したがって米の蛋白質の量と質の改良をすることは，国民保健上大変意義深いことと思われます。

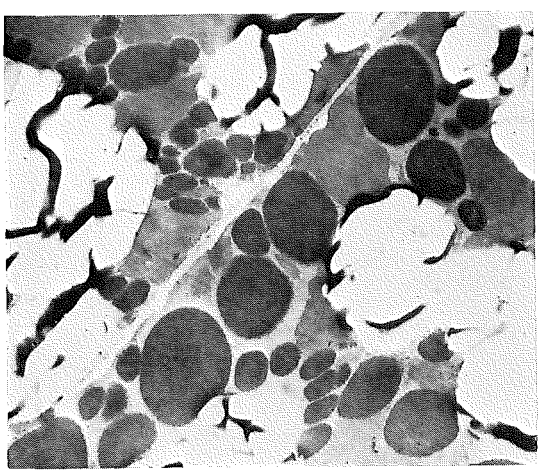
放射線育種場では，多数のイネの突然変異を得ていますが，その中に蛋白質含有率が親品種の2.5倍もあるものや，8割以下しかないものなどが見つかっています。このことは，放射線によって蛋白質に関する突然変異の誘起が可能であることを実証し，高蛋白品種の育成に放射線育種が有効であることを示唆しています。

写真では，高蛋白で比較的多収な早生突然変異系統 No. 5 の草型と，その米の澱粉層内の蛋白体の分布状況を示しています。No. 5 の玄米の蛋白含有率は約 12% で，親品種の2倍近く増加しています。澱粉顆粒（白色部）の間隙を埋めて蛋白体（黒色まり藻状）が増加している様子がわかります。

図は親品種農林8号から得られた545突然変異系統の蛋白質含有率の分布を示しています。親品種の蛋白質含有率が 6.5% であるのに比べて，最高 16.3%，最低 4.2% の間に大きく変



農林8号
Norin No. 8



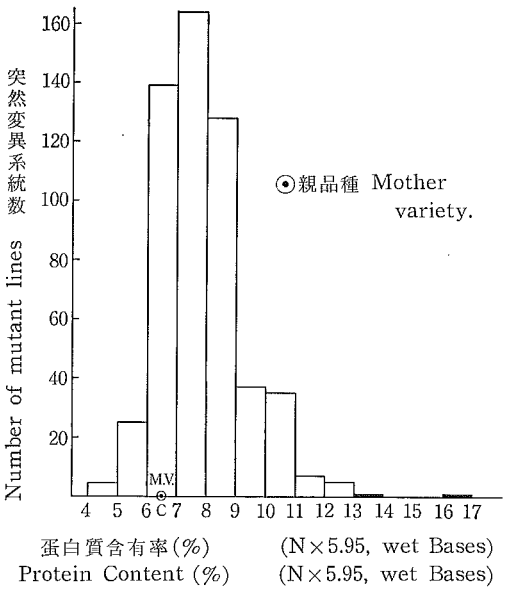
突然変異 No. 5
Mutant No. 5

写真(2) 澱粉層内の蛋白体の分布
Photo. (2) Cross-section of Starch Layer of Rice Endosperm showing Compound Starch Granules and Protein Bodies (×3400倍)

異しています。

表には高蛋白米と低蛋白米の玄米のアミノ酸含有量を示してあります。米の栄養価を支配するリジン，スレオニン等は，高蛋白米では増加し，低蛋白米では減少しており，高蛋白米で相対的な栄養価が低下するとは思われません。

これらのことから，高蛋白品種を育成するのに放射線による突然変異を利用することが大変有効な一方法であると結論されましょう。 （田中幸彦）



図． 農林8号の突然変異 545 系統の蛋白質含有率の分布

Fig. Distribution of Protein Content of 454 Mutant Lines from Rice Variety Norin No. 8

表． 高，低蛋白突然変異系統のアミノ酸含有量 (mg/gr 玄米)

Table. Aminoacids Contents in Brown Rice of High or Low Protein Mutants (mg/g for Respective Aminoacid)

アミノ酸 Amino acids	高蛋白突然変異系統 High protein mutants		親品種 Mother variety Norin No. 8	低蛋白突然変異系統 Low protein mutants	
	No. 4	No. 5		No. 91	No.312
リジン Lysine	4.15	4.39	2.71	1.63	2.17
スレオニン Threonine	4.22	4.01	2.11	1.74	1.85
その他 Others	94.13	93.11	48.07	36.70	37.68
計 Total	102.50	101.51	52.89	40.07	41.70
比 Ratio*	193.8	191.2	100.0	75.8	78.8

註： 比*… $\frac{\text{突然変異系統のアミノ酸合計}}{\text{親品種のアミノ酸合計}} \times 100$

Remark: Ratio— $\frac{\text{Total aminoacid of mutant lines}}{\text{Total aminoacid of the mother variety}} \times 100$

In Japan, we obtain one third of total protein intake from rice. Protein of polished rice has the best nutritive quality among grains. If the content of essential aminoacids, lysine, etc., could be increased, rice could be a rich souce of protein comparable with animal protein. Thus, in rice improvement one of the objects is to increase the protein content and to change the ratio of consituent aminoacids.

At the Institute of Radiation Breeding, we obtained a number of mutant lines in rice. Of these lines we have found some high protein mutants showing 2.5 times higher protein content than the mother variety and some low protein mutants having less than 80% content in comparison with that of the mother variety. This fact indicates that mutations concerning protein content in rice can be induced by radiation and utilization of radiation-induced mutant should be very effective for breeding in rice with high protein content.

Distribution of protein contents of 545 mutant lines derived from the variety Norin No. 8 are shown in Figure. The protein contents of brown rice were 6.5% in the mother variety, 16.3% in the mutant line No. 835 which has the highest protein content and 4.2% in the mutant line No. 91 which has the lowest protein content respectively. Taking the protein content of the mother variety as 100, the content indexes of mutant lines varied largely between 251 and 76.

In two lines which have protein content more than 190% of that of the mother variety and two lines having less than 80% of the content, aminoacids constituent in brown rice are presented in Table. The content of lysine and threonine that have high nutritive quality were increased in high protein mutants, while that decreased in the low protein mutants. No clear correlation was recognized between lysine content and protein content.

Plant stature of the mutant line No. 5 which shows early maturity, high yielding capacity and high protein content and of the mother variety is shown in Photograph 1. Cross-sections of starch layer of endosperm are also shown in Photograph 2. Protein contents were 15-13% in the mutant line No. 5, therefore, it has two times higher content than the mother variety. Structure of the high protein line No. 5 was markedly defferent from that of the mother variety. We can see that protein bodies (black bodies) in crevices of starch granules (white granules) located in a starch layer of an endosperm of the mutant line No. 5 were distinctly increased.

In conclusion, we should like to say that utilization of mutations should be very effective for breeding in rice with high protein content.

(S. Tanaka)