TARC Note

Relationship between Grain Width and Occurrence of White Belly and White Core, as a Factor Responsible for Slender Grain Shape of Indica Rice

It is recognized that, in general, indica rice is long and slender in grain shape, while japonica rice is short and round. This difference in grain shape has been used as one of the important traits to distinguish indica rice varieties from japonica ones. However, any factor responsible for this difference has not been known except such a general explanation as genetic difference. In this connection, the result of the present study that was carried out in cooperation with rice breeding section in MARDI, Bumbong Lima, Malaysia, offers an interesting fact regarding the cause of slendar grains of indica rice.

In the experiment, 22 indica varieties having different grain width were grown, together with 5 japonica varieties in an experimental field-plot in the off season (April to September), 1985. Two main panicles were sampled from each variety, and grain length and width were measured with 5 grains taken from each panicle. Percentage of white belly or white core grains to the total number of grains was estimated with 10 grains.

The results are shown in Table 1. The

Table 1. Varietal difference of grain traits in rice

Varieties	Grain length (mm)	Grain width (mm)	White belly grains (%)	White belly or core grains (%)
Indica				
Kadaria	6.7	2.7	0	5
IR 42	6.8	2.8	0	0
Cica 4	7.7	2.6	0	0
IR 26	7.0	2.9	0	15
BR 171-2B	7.6	2.9	75	80
PAU 50B	7.8	2.7	5	15
ITA 212	7.5	2.7	0	5
IR 44	7.6	3.0	0	40
IET 2815	7.3	3.0	80	100
IR 18349	8.1	3.0	25	30
UPR 254-85	7.0	3.0	15	80
IR 1163-132	7.8	3.0	5	55
IR 854-119	7.3	3.1	85	95
IR 3273-67P	7.7	3.2	100	100
IR 8	7.6	3.2	95	100
IET 1785	7.6	3.1	80	100
RD 17	8.2	3.2	100	100
Biblap	6.7	3.2	90	95
IET 2707	6.3	3.2	95	100
DGWG	6.7	3.4	100	100
BR 316-15	6.9	3.1	100	100
Milyang 42	6.1	3.2	90	90
Japonica				
Kyokukei 865	5.4	3.4	0	0
Ardito	5.8	3.4	10	15
Shin 2	5.6	3.4	5	10
Reimei	5.7	3.5	0	0
Shin-chu 56	5.5	3.7	35	35

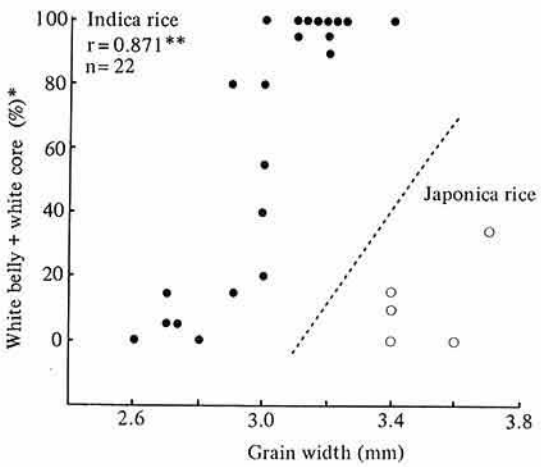

Fig. 1. Relationship between grain width and occurrence of white belly and white core
* White belly and white core grains in percentage to the total number of grains.

occurrence of white belly was much more frequent than that of white core, and the sum of them was indicated in percentage to the total number of grains. As given in Fig. 1, high correlation, r=0.871,** was found out between grain width and occurrence of white belly and white core in indica rice. The percentage of white belly and white core grains reached higher than 90% when the grain width was more than 3.1 mm. On the other hand, the japonica varieties showed the percentage lower than 50% for the grain width more than 3.1 mm.

No correlation between grain length and percentage of white belly and white core was observed with indica rice (r=−0.148).

Although Bhattacharya[1] mentioned that white belly in rice is strongly correlated with kernel breadth, it has not been known whether indica rice and japonica rice behave similarly on this trait, because their trait has never been compared each other under the comparable condition. In the present study, it was found that the rate of occurrence of white belly and white core in indica rice is markedly higher than that of japonica rice when the grain width is more than 3.1 mm. As a matter of fact, in the process of varietal improvement of indica rice, it seems that it is impossible to select varieties with good grain quality (without white belly and core) when the grain width is same as that of japonica varieties, i.e., about 3.4 or 3.5 mm. As the result, in the selection for good grain quality, grains with small grain width have to be selected. As the white belly and white core causes broken rice, farmers like to grow varieties with small grain width.

On the other hand, grains of big size are required to achieve a high yield, and, therefore, long but slender grains have been selected. In a word, the long and slender shape of indica rice is able to meet the requirement for both high yield and good grain quality. In fact, recently improved indica varieties have long and slender grains while unimproved old indica varieties have many kinds of grain shape because they were not selected with emphasis on good grain quality. This concept may appear hypothetical, but the author believes that it deserves further studies.

1) Bhattacharya, K. R.: How rice quality impinges on its quantitative availability and optimal utilization. F A O Regional Office for Asia and the Pacific, Bangkok, Thailand (1983).

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