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Milling Quality of Some *Indica* and *Japonica* Genotypes of Paddy

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ABSTRACT The physical and milling characteristics of nine *indica* and *japonica* genotypes of paddy grown commercially in Himachal Pradesh were determined. The effect of parboiling on milling quality of paddy was also ascertained. The results showed significant differences among different genotypes with respect to kernel weight, kernel length, length/width ratio (L/W), density, bulk density, porosity, brown and head rice recoveries. The parboiling of paddy significantly increased the brown and head rice recoveries of both *indica* and *japonica* genotypes.

INTRODUCTION

The milling characteristic of paddy are important from the stand point of rice quality and are directly related to the milling capabilities *i.e.* amount of brown rice, head rice, husk and brokens. The objective of milling is to remove the bran layers and germ with a minimum grain breakage. From the economic point of view, brokens not only lower the market value but also lead to physical losses which lower the total milling turnout. The present study aims at determining the milling quality of some *indica* and *japonica* genotypes grown commercially in Himachal Pradesh (H.P.) and to ascertain the effect of parboiling on milling quality of these genotypes.

MATERIALS AND METHODS

Materials

Paddy samples of nine genotypes belonging to *indica* and *japonica* groups were procured from the Rice Research Station, Malan (Kangra) and Research Sub-Station, Katrain (Kullu) of Himachal Pradesh Agriculture University (Palampur).

Methods

Physical Characteristics of Paddy: Thousand kernel weight and length/width ratio (L/W) were determined according to AACC (1976) procedures. Density was determined by the method of Bhattacharya et al. (1972). Bulk density was determined by pouring the sample in a vessel of known volume, from a constant height. The mass of sample occupying that volume was determined and bulk density was calculated. Porosity was calculated by subtracting the bulk density value from density and then dividing with density value.

Parboiling of Paddy: The samples were parboiled by soaking in warm water (70 ± 2°C) for 3.5 hours, draining and autoclaving at 1.05 kg/cm^2 for 15-25 minutes depending upon the genotype, till no white core was left. The paddy was then dried in shade till 12± 2 per cent moisture level was attained.

Milling Characteristics: Weighted samples (100g) were dehusked in a laboratory sheller (satake Rice sheller, Japan) equipped with rubber rolls and polished using McGill Miller No.2 (USA) to obtain a 6 per cent degree of polish. Broken grains were separated using a laboratory Model Rice Sizing Device (Burrows make, USA) and yields of brown rice, head rice and brokens were calculated.

Statistical Analysis of Data: The data on different parameters were analysed using RBD design (Steel and Torrie, 1960) and replicated thrice.

RESULTS AND DISCUSSION

Physical Characteristics of Paddy: The data on physical characteristics of different paddy genotypes is presented in table 1. The genotypes varied significantly with respect to kernel weight, kernel length, length/width ratio (L/W), density, bulk density and porosity. The kernel length and length/width ratio (L/W) of *indica* genotypes were greater than *japonica* genotypes. The genotype kasturi has the maximum kernel length (10.40mm) and length/width ratio (5.20), while the kernel

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Table 1: Physical characteristics of different paddy genotypes

Genotype	*Category*	*1000 kernel weight (g)*	*Kernel length (mm)*	*L/B ratio*	*Bulk density (g/ml)*	*Density (g/ml)*	*Porosity (%)*
HPU2216	*indica*	23.51	8.10	3.52	0.53	1.11	52.25
RP 2421	*indica*	24.85	8.50	3.40	0.61	1.22	50.00
HPU845	*indica*	23.61	9.50	3.96	0.50	1.18	57.63
Kasturi	*indica*	22.73	10.40	5.20	0.46	1.25	63.20
China Purple	*indica*	26.01	8.60	3.00	0.65	1.32	53.60
Naggar Dhan	*japonica*	25.69	7.60	2.38	0.67	1.19	43.70
Norin18	*japonica*	25.39	7.10	2.22	0.64	1.22	47.54
Matali	*japonica*	24.69	7.20	2.25	0.52	1.09	52.29
Jatoo	*japonica*	24.34	7.00	2.25	0.52	1.04	52.00
C.D (0.05)		1.65	0.08	0.02	0.08	0.06	2.49

weight was the minimum (22.73g). The bulk density value was the maximum in Naggar Dhan, thus will require least space for storage. The density value of genotypes understudy ranged from 1.04 to 1.32g/ml and compare very well with those reported by Bhattacharya et al. (1972) and Saikia and Bains (1990). The porosity values of *japonica* genotypes were comparatively lower than *indica* genotypes.

Effect of Parboiling on Milling Quality: As shown in table 2 parboiling of paddy significantly increased the brown rice and head rice recoveries. The parboiled rice suffered less breakage during milling. This could be attributed to the hardening of grain during parboiling process.

Table 2: Effect of parboiling on milling quality of paddy

Treatment	*Brown rice (%)*	*Husk (%)*	*Head rice (%)*	*Broken (%)*
Non-Parboiled	80.47	19.53	73.60	26.40
Parboiled	81.51	18.49	82.28	17.71
C.D (0.05)	0.43	0.37	0.42	0.51

Effect of Genotype on Milling Quality: The results showing the effect of genotype on brown rice recovery, head rice recovery, husk and broken percentage are given in table 3. The brown rice recovery, husk, head rice recovery and brokens from different genotypes varied significantly. In general, *japonica* genotypes gave higher brown and head rice recoveries except for Jatoo. The long grained *indicas* suffered greater breakage during milling. The genotype Kasturi gave the maximum brokens while, Norin 18 gave the minimum. Juliano et al. (1993) and Sun and Seibenmorgen (1993) also reported significant variations in the head rice yield of different varieties.

Table 3: Effects of genotypes on milling quality of paddy

Genotype	*Category*	*Brown rice (%)*	*Husk (%)*	*Head rice (%)*	*Broken (%)*
HPU 2216	*indica*	79.36	20.64	78.15	21.85
RP 2421	*indica*	81.32	18.68	80.54	19.46
PHU 845	*indica*	79.74	20.26	75.59	24.41
Kasturi	*indica*	79.71	20.29	69.10	30.90
China Purple	*indica*	80.92	19.08	76.36	23.64
Naggar Dhan	*japonica*	82.52	17.48	82.28	17.72
Norin 18	*japonica*	82.93	17.07	86.01	13.99
Matali	*japonica*	81.34	18.66	80.86	19.14
Jatoo	*japonica*	81.10	18.90	72.60	27.40
C.D. (0.05)		0.91	0.79	0.90	1.09

CONCLUSION

The results of the study revealed significant variations in the physical and milling characteristics of different paddy genotypes. The milling quality of *japonica* genotypes was found to be better than *indicas* and parboiling of paddy improved the milling quality of both *indica* and *japonica* genotypes.

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