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Effect of Degree of Milling on Milling Qualities of Glutinous and Non-Glutinous Paddy

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Abstract—*Paddy is dehulled to obtain brown rice, which is milled before consumption. Degree of milling (DOM) affects various intrinsic and extrinsic properties of rice. Paddy (one each of glutinous and non- glutinous variety) was abrasively milled to various degree of milling (0-21%). The study was undertaken to model the milling qualities i.e. head rice yield (HRY) which was found to decrease for non-glutinous rice variety from 66.87% at DOM 0% to 42.24% at DOM 21%. For glutinous variety, it was found to decrease from 71.38% at DOM 0% to 40% at DOM 21%. The total yield was also found to be decreasing with increase in DOM i.e. 74.09% at DOM 0% to 65.57% at DOM 21% for non-glutinous variety and for glutinous variety it was found to be 74.087% to 70.112% (DOM 0-21%). Thus, it was concluded in the study that degree of milling strongly affects the various quality aspects of milled rice which were successfully modelled during milling operation giving an average estimation that non-glutinous rice variety provide more broken and less head yield and total yield than glutinous varieties.*

Keywords*: (degree of milling, glutinous, head rice, non-glutinous, paddy total yield).*

1. INTRODUCTION

As a main source of nourishment for over half the world's population, rice is by far one of the most important commercial food crop. Un-milled rice, known as paddy is usually harvested when the grains have a moisture content of around 25%. Harvesting is followed by threshing, etc. Paddy or rice grain consists of husk and brown rice. Rice milling is removal or separation of husk (dehusking) and bran to obtain the edible portion for consumption. Degree of milling is one of the factors that influence consumers' perception of quality. The quantity of bran removed is referred to as the "degree of milling" and the intended use of rice dictates the level of bran removal.

2. MATERIALS AND METHODS

The milling test was carried out in the Satake Laboratory mill (of rubber roller type). Samples of one kilogram each, of clean paddy at moisture content of 13.5 ± 1% (w.b.) was taken for the test. Moisture contents were determined using a Satake moisture meter[1] .Care was taken to allow sufficient tempering period after drying to minimize the temperature and moisture stress before milling. The clearance between the rollers of the sheller was adjusted to half the average thickness of the grain samples. It was observed that at that clearance, shelling percentage of some of the varieties was 90 per cent. When the clearance was reduced, the shelling percent was increased but broken percentage was also increased correspondingly. Hence, instead of reducing clearance further, two passes were used to increase the shelling efficiency. Shelled paddy was then polished in an abrasive type Satake laboratory polisher to a desired degree by adjusting the duration of polishing. Bran from polisher was collected in a sample pan and polished rice from the polisher was collected in the closed condition for one hour to have equilibrium temperature with the atmosphere.

Milling quality in terms of husk content, broken, degree of polish, head yield and total yields were evaluated[2]. Following relationships were used for calculations:

$$a.\,\text{Husk content}\ (\%) = \frac{\text{Weight of husk}}{\text{Weight of paddy shelled}} \times 100$$

$$b.\,Degree\ of\ polish\ (\%) = \frac{Weight\ of\ bran}{weight\ of\ brown\ rice} \times 100$$

$$c.\,Head\ yield\ (\%) = \frac{Weight\ of\ head\ rice}{weight\ of\ paddy\ sample} \times 100$$

$$d.\,Broken\ (\%) = \frac{Weight\ of\ broken\ rice}{Weight\ of\ polished\ rice} \times 100$$

$$e.\,Total\ yield\ (\%) = \frac{Weight\ of\ polished\ rice}{Weightof\ paddy\ sample} \times 100$$

Polished rice was then graded by a rice-sizing device to remove fine, medium and broken from the rice sample.

Broken equal to or greater then ¾th length of the whole kernel was considered as head rice.

2.1 Varieties considered for test:

Mahsuri and Bora

3. RESULT AND DISCUSSION

Milling qualities of non-glutinous and glutinous varieties of rice obtained from the test are given in the Table 1. A comparative head yield recovery and total yield percent of non-glutinous and glutinous varieties are presented (Fig.1, 2). In the table, we can see that glutinous variety has much higher head rice and total yield percentage in each treatment than non-glutinous variety. Whereas the broken percentage is more in non-glutinous variety than glutinous one.

Table 1: Comparative study on Milling quality of non-glutinous and glutinous varieties of rice: Moisture content: 13.5 ±1 % (w.b)

Sl No.	Treatments	DOM (%)	Broken (non-glutinous) (%)	Broken (glutinous) (%)	Total Yield (non-glutinous) (%)	Total Yield (glutinous) (%)	Head Yield (non-glutinous) (%)	Head Yield (glutinous) (%)
1	T_1	0	9.73	2.7041	74.09	74.087	66.87833	71.38282
2	T_2	6	16.887	4.9692	75.000	75.635	62.33143	70.66578
3	T_3	9	15.24	4.7879	64.18	64.182	54.40066	59.39402
4	T_4	15	17.72	10.869	67.550	68.021	55.58096	57.15124
5	T_5	21	35.57	26.551	65.570	70.112	42.24675	43.56059

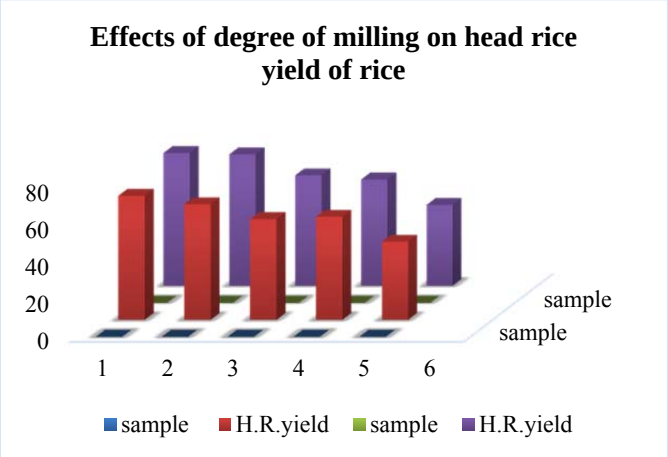

Fig 1: Graphical representation of head rice yield of both *Bora* and *Mahsuri* varieties.

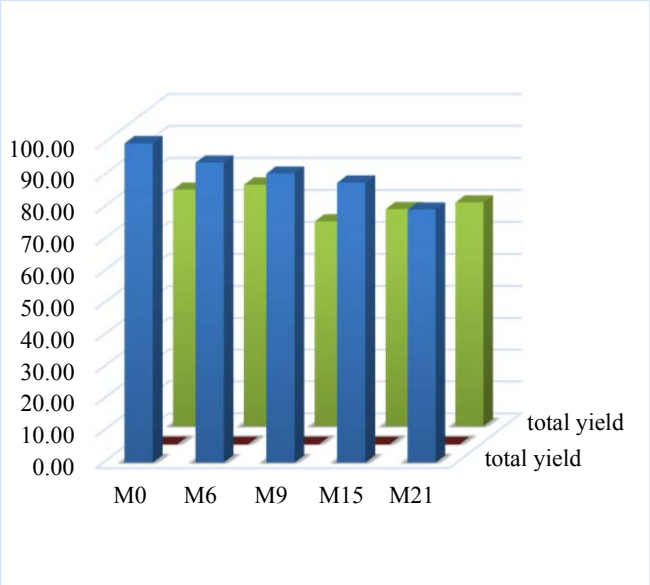

Fig 2: Graphical representation of total yield of both *Bora* and *Mahsuri* varieties.

4. CONCLUSION

With an average 19.02% of broken in non-glutinous rice variety whereas it 9.97% broken in case of glutinous variety describing a difference of approximately 10%. While in case of head rice and total yield *Bora* rice shows a higher percentage than *Mahsuri* rice. Hence rendering the better milling quality for glutinous varieties of rice considering milling properties in which a slight increase in DOM ≥9% is not desirable for non-glutinous rice whereas for glutinous variety the DOM can be ≥9%.

5. ACKNOWLEDGEMENT

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