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Studies on Rice Bran and Rice Bran Oil

II. Quality of rice bran oil as influenced by varieties, polishing and parboiling

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In this study, it was found that there was varietal influence on the intial content of FFA, saponification and iodine value. Among raw and parboiled paddy, the parboiled paddy resulted in a decrease of FFA, content. Iodine value and increase in saponification value of oil. Generally, the bran separated over a longer duration of poilishing had higher FFA, saponification value and iodine value.

The production of bran oil is gaining importance in countries like India due to acute oil shortage. Due to the possibility of rapid deterioration of bran oil immediately after separation of bran from paddy, the quality of bran oil is assessed by the initial FFA, saponification value and iodine value.

Rao *et al* (1960) concluded that the FFA, saponification value and iodine value of the rice germ oil ranged from 0.80 to 2.5 percent' 177 to 192 and 95 to 98 respectively. Kumar David *et al* (1864) found that the FFA, saponification value and iodine value of raw rice bran oil ranged from 1.1 to 74.7 per cent, 170 to 197.7 and 89.3 to 100.5 respectively. According to ISI (1965), the FFA content, saponification and iodine value of the rice bran oil should be 80, 175 to 195 and 85 to 105 respectively. Further in earlier studies, polishing was reported based on the weight of bran renewed as 2%, 4% and 6% (Kumaresan & Sree Remulu 1978) which does not reflect the hardening due parboiling. Hence a study was made to find out the variation of these values due to varieties, degree of polishing based on duration of polishing &parboiling. Hence the following study was taken up.

MATERIAL AND METHODS

Thirty varieties of paddy samples were collected from the paddy Breeding Station, Coimbatore. Part of the paddy samples of each variety was parboiled as per the method of Subramanyam and Dakshinamoorthy (1977). Both raw and parboiled samples were milled separately in a laboratory rubber roller sheller and the brown rice obtained was milled in a Mc Gill type polisher for different duration vize 2, 4 and 6 minutes. Bran collected at different stages of polishing were sieved through a 25 mesh sieve to remove broken rice and then weighed. The oil in the bran was extracted with hexane and the FFA content, saponification and iodine values of the oil were determined as per A.O.A.C. (1962) method and the results of the above study are presented in the table. I.

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RESULTS AND DISCUSSION

Free Fatty Acid Content

The initial free fatty acid (FFA) of raw bran oil ranged from 1.27 (Co 37) to 2.45 (TNAU 136 13), 1.62 (Co 39, Co 35) to 2 44 (IET 5656) and 1.80 (Co 40) to 2.57 (IET 5655) for the 2, 4 and 6 minute polishings indicating that the FFA content of bran oil varied with varieties and degree of polishing. This is in agreement with the results reported by Hartman and Lago (1970). The corresponding values for parboiled bran oil ranged from 1.17 (Co 35) to 2.35 (TNAU 1756), from 1.55 (Co 39) to 2.34 (IET 56 56) and from 1.20 (TNAU 18520) to 2.31 (IET 56 56) indicating that the initial FFA content was significantly higher in the case of bran oil from raw paddy. As the parboiling operation involves boiling of paddy to high temperatures, it could have arrested the development of FFA in the oil from the parboiled rice. With the progressive increase in duration of polishing, significant increase in the FFA content of bran was observed. The FFA contents of the oil extracted in different degrees of polishing were within the range of ISI specification (1965).

Saponification value

The saponification value of oil from raw bran was maximum in Bhavani and minimum in TKM 6, irrespective of the duration of polishing. The minimum values ranged from 178 at 2 minute polishing to 180 at 6 minute polishing. The maximum values were 202, 204 and 200 at 2, 4 and 6 minute polishings. In case of bran oil from parboiled paddy, again the variety TKM 6 registered the minimum value, while the varieties Bhavani and TNAU 18610 registered the maximum value at all the 3 levels of polishings The saponification value of bran oil was significantly increased due to parboiling of paddy. The exact mechanism for this increase is not known and needs further study.

Iodine value

The iodine value of raw bran oil was highest in GEB 24 and lowest in Co 39 at all the 3 levels of polishings. In case of parboiled bran oil, Co 35 registered highest iodine value in all but 4 minute polishing and Co 39 recorded the lowest value in all but 2 minute polishing. Among the 2 kinds of bran oil, the oil obtained from raw paddy had a significantly higher iodine value than that of parboiled paddy. Shabeen *et al* (1975) reported a 6.5 to 8.5 per cent reduction in the iodine value of bran oil due to parboiling. This decrease in iodine value could be attributed to the possible saturation of double bonds of fatty acids during parboiling. The increase in iodine value was influenced by the increase in duration of polishing. This might be due to the oil obtained from starchy endosperm and aleurone layers. The iodine value of the oil extracted from different durations of polishing were within the range of ISI (1965) specifications.

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Table 1 Effect of parboiling and polishing on the initial free fatty acid content of oil of different varieties

Variety	Raw			Parboiled			Variety	Raw			Parboiled		
	Degrees of Polising							Degrees of Polising					
	2	4	6	2	4	6		2	4	6	2	4	6
TKM 6	1.7	1.9	2.1	1 6	1.7	1.9	I&T 5721	2 0	2 0	2.3	1.8	2.0	2.1
Kannaki	1.7	2.1	2.2	1.6	2 0	2.0	„ 5656	2.1	2.4	2.5	1.4	2.3	2.3
Bhavani	1.7	1.9	2 0	1.6	1.8	1.9	TNAU 13253	1.9	2.3	2.4	1.3	1.8	2.2
Co 40	1.8	1.6	1.8	1.4	1.6	1.7	„ 17005	2.1	2.0	1.8	1·9	1.6	1.8
Co 36	1.8	1.7	1.8	1.6	1.6	1.8	„ 15869	1.8	1.9	2.1	1.4	1.6	2.0
Ponni	1 4	1.7	1.8	1.4	1.6	1.8	„ 20392	2 0	1.9	1.8	1.9	1.8	1.8
Co 38	1.4	1.6	1.8	1 3	1.5	1.8	„ 18610	1.8	1.7	1.8	1 6	1 6	1.8
IR 20	1.5	1.9	2.1	1.3	1.8	2,0	„ 4372	1.8	1.9	2.1	1.7	1.9	2.0
ADT 31	1.6	1.7	1.9	1,4	1.7	1.9	„ 15796/4/1	2.2	1.7	2.1	2.1	1,6	1.9
IR 28	1,2	1.9	2 2	1.4	1.8	2.0	„ 13613	2.4	1,7	2.2	1,5	1,8	1,9
Co 35	1.2	1.6	1.8	1.1	1.5	1.7	„ 18620	2.3	2.0	2.1	2.0	1.9	1.7
Co 37	1,2	1.8	1.9	1.2	1.8	1.8	„ 1750	2.3	1.9	1.9	2.3	1.7	1.9
EB 24	1.9	1.7	1.8	1.8	1.6	1.8	„ 48027	2.0	1.9	1 9	1.6	1.8	1.8
Co 41	2.1	1.9	2.1	1.6	1.8	1.9	„ 1577613	2.2	1.7	2.0	1 9	1.9	1·7
Co 39	1.6	1 6	1.8	1.2	1.5	1·7	„ 17069	1.8	1.8	1.9	1.7	1.8	1.9

Table 2 Effect of parboiling and polishing on the saponification value of oil of different varieties of

Variety	Raw			Parboiled			Variety	Raw			Parboiled		
	Degrees of Polishing							Degrees of Polishing					
	2	4	6	2	4	6		2	4	6	2	4	6
TKM 6	178	178	183	180	182	180	IET 5721	192	194	191	193	194	192
Kannaki	197	197	195	196	197	194	„ 5656	190	191	189	190	191	188
Bhavani	202	204	200	200	199	197	TNAU 13253/7/2	193	194	193	192	193	190
Co 40	184	186	182	183	185	183	„ 17005	183	183	181	185	187	183
Co 38	185	186	183	185	187	186	„ 15869/2	195	196	194	196	195	195
Ponni	188	189	187	187	188	186	„ 20892	194	196	193	196	193	195
Co 36	180	181	180	181	183	180	„ 18610	196	200	198	200	201	198
IR 28	195	195	193	194	196	192	„ 4372	190	191	189	191	195	190
ADT 31	191	192	190	192	191	192	„ 15796/4/1	192	193	189	193	194	192
IR 20	194	196	192	196	197	195	„ 13613	188	190	187	190	191	189
Co 35	194	196	193	195	196	195	„ 18520	195	196	194	196	197	195
Co 37	187	189	186	189	188	189	„ 1750	196	196	196	198	199	193
GEB 24	186	187	184	187	187	186	„ 48027	186	187	185	185	186	184
Co 41	194	196	192	196	196	195	„ 15776/3	185	189	186	186	186	185
Co 39	195	196	194	196	199	195	„ 17069	187	189	186	188	189	185

Table 3. Effect of parboiling and polishing on the iodine value of oil from different varieties of rice

Variety	Raw			Parboiled			Variety	Raw			Parboiled		
	Degrees of Polishing							Degrees of Polishing					
	2	4	6	2	4	6		2	4	6	2	4	6
TKM 6	93	24	96	94	93	92	IET 6721	91	92	89	87	93	86
Kannaki	88	87	88	90	90	89	„ 5656	92	94	90	89	95	88
Bhavani	87	90	87	94	93	93	TNAU 13253/7/2	85	87	84	84	88	84
Co 40	85	87	83	84	83	83	„ 17005	90	91	89	87	93	87
Co 38	94	96	93	94	96	94	„ 15869/2	95	96	94	95	97	95
Ponni	97	98	96	92	97	90	„ 20892	90	91	89	88	92	89
Co 36	90	92	90	90	91	89	„ 18610	83	84	82	86	86	85
IR 28	97	99	96	85	100	85	„ 4372	86	86	85	83	87	82
ADT 31	95	96	95	97	97	96	„ 15796/4/1	84	85	84	82	86	82
IR 20	95	97	94	92	97	91	„ 13613	84	86	83	86	86	85
Co 35	95	95	94	98	96	97	„ 18520	85	86	86	85	87	85
Co 37	98	98	97	93	99	92	„ 1750	91	92	90	91	91	90
GEB 24	100	101	98	97	100	96	„ 48027	90	92	90	91	93	90
Co 41	99	100	98	96	98	96	„ 15776/3	82	83	82	79	84	80
Co 39	81	83	80	81	84	80	„ 17069	89	90	89	88	90	86