028/A

Effect of different processing methods on starch structure: A microscopic study

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Starch is crystalline in its native state. When heated in the presence of water, starch gelatinizes. This may result in the increase of the GI values of foods prepared by using wet heat. According to a previous study the dry heat processed meals showed significantly low GI (±SEM) values (wheat roti: 72±6, rice flour roti: 69±7, kurakkan roti: 70±8 and atta roti: 67±9) than that of wet heat processed meals (wheat pittu: 101±9, rice flour pittu: 103±7, kurakkan pittu: 84±6 and hoppers: 120±8). Thus the objective of this study was to investigate the effect of different processing on the degree of starch gelatinization and to correlate to the GI of the said foods. Roti (4 types) were cooked (dry heat) with coconut scrapings and flour (wheat only, wheat and rice- 1:1 w/w, wheat and kurakkan- 2:3 w/w or atta only) at 1:1 w/w. Pittu (3 types) was prepared (wet heat) with coconut scrapings and flour (wheat, rice or kurakkan) at 1:1 w/w. Hoppers was made using rice flour and the first extraction of coconut milk (10 h incubation). The isolated starch from foods was examined under the light microscope (x400 or x100) and the lengths and breadths of mature starch granules (n=10) measured.

Table 1. Percentage increase in the sizes of dry heat and wet heat processed starch granules compared to the corresponding raw flour starch granules

	Wheat starch		Rice starch		Kurakkan starch		Atta starch	
	Length	Breadth	Length	Breadth	Length	Breadth	Length	Breadth
Dry heat								
Wheat roti	35	30	-	-	-	-	-	-
Rice flour roti	25	26	>100	88	-	-	-	-
Kurakkan roti	31	31	-	-	>100	>200	-	-
Atta roti	-	-	-	-	-	-	30	27
Wet heat								
Wheat pittu	48	49	-	-	-	-	-	-
Rice flour pittu	-	-	DI	DI	-	-	-	-
Kurakkan pittu	-	-			DI	DI	-	-
Hoppers	-	-	DI	DI	-	-	-	-

DI – disintegrated

The increase in the lengths and breadths of starch granules compared to raw starch in wheat roti was significantly lower than that of wheat pittu ($p<0.05$). The light microscopic study revealed that the degree of swelling and disintegration of starch granules in pittu & hoppers were higher than that of

roti. Thus the reason for the significantly low GI values of roti compared to pittu and hoppers can be attributed to less disintegrated and swelled starch granular structure. This shows that the wet heat processing gelatinizes starch granules to a greater extent than that of dry heat processing. This correlates with the findings that foods processed using wet heat having higher GI values.

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