

Chemical Composition and Cooking Quality of Some Improved Varieties of Redgram Dhal

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Chemical composition, cooking and organoleptic qualities and physical characteristics of redgram varieties, CO 1 and CO 2, were studied and compared with those of the newly released variety CO 3 and three other improved varieties. CO 3 and CO 1 had higher protein content. CO 1 performed better in cooking and organoleptic qualities than all other varieties. There was no significant difference in taste, physical characteristics and flavour among the varieties tested.

Pulses are an important sources of protein in the Indian diet. Redgram (*Cajanus cajan*) is one of the important pulse crops of India. Two important varieties of this crop in Tamil Nadu are CO 1 and CO 2. CO 3 is a mutant of CO 1. Co 3 has recorded an average grain yield of 13.3 quintals/ha in 180 days under varying environmental conditions, which represents a 54% increase in yield over CO 2. (Annappan 1977). CO 3 is also photinsensitive, tolerant to wilt, resistant to root rot and bears pods on interterminal clusters. These varieties along with three pre-release strains were chemically analysed for their nutritive value and have been compared for cooking and organoleptic qualities. Their physical characteristics were also evaluated. These data are presented in this paper.

MATERIAL AND METHODS

Grain samples of CO 1, CO 2, CO 3, S 12, S 14 and S 19 were obtained from

the Department of Agricultural Botany. The unsplit whole grain was used to determine the physical characteristics (Battacharya *et al.* 1972). The dhal was prepared by soaking the seeds in water for 12 hours, coating the soaked seeds with red earth, drying in the sun and then milling in a stone mill. The husk was removed and the dehusked split dhal was used for other studies. Proximate composition was determined in the finely ground whole flour obtained from the dhal. Moisture was estimated by drying at 110°C for 1- hours in an oven. Nitrogen and ash were determined by AQAC methods (1975). Total and reducing sugars were analysed by the method of Somogyi (1915). Fat was estimated by soxhlet extraction with petroleum ether (60-80°C) for 12 hours. Cooking time was determined by cooking 5 g of the dhal in an excess volume of 35 ml of water in test tubes kept immersed in a boiling water bath until the grains were cooked (tested by pressing between fingers). The cooked weight of

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the dhal, volume of cooked dhal, and solids lost in cooking water were obtained by cooking 5 g of the dhal with excess of water in test tubes on a boiling water bath for the period of cooking time already determined. The excess water was decanted, filtered and made up to 100 ml to determine the dissolved solids. The volume of the dhal occupied in the test tube was then noted and any adhering water was removed by gently blotting with filter paper and the weight increase was noted. From this, the volume increase and the weight increase during cooking per 100 g of the dhal were calculated. For cooking in pressure cooker, cooking was conducted independently for different lengths of time and the period after the pressure reached 15 psi was counted. Organoleptic evaluation of the cooked and uncooked dhals was conducted with 25 untrained judges who evaluated the varieties for colour, flavour and taste on a hedonic scale of 1 to 3.

RESULTS AND DISCUSSION

The chemical composition of the different varieties tested are given in Table I. The protein content of the

newly released variety CO 3 was similar to that of CO 1 and these two varieties were superior to the rest of the varieties. CO 1 had a protein content of 24.44%. This value was higher than the earlier reported value of 21.4% (Rathinaswamy *et al.* (1973). This variation could be due to the difference in agronomic factors, particularly fertiliser applications. Total protein content in redgram normally ranges between 19.73 and 24.44%. The present protein values agree fairly well with the values given by Gopalan *et al.* (1971) and Abdi and Sahib (1976). There was not much difference in the rest of the proximate principles among the different varieties.

The housewives prefer a dhal which gets cooked in minimum time and shows the maximum increase in the cooked volume. This type of dhal fetches higher price. The cooking characteristics of the different varieties of dhals are given in Table II. Kurien *et al.* (1972) stated that cooking time of various grain legumes varied from 30 minutes to one hour. In this study the cooking time for CO 1 was 40 minutes whereas for other varieties it was 50 to

TABLE I. Proximate composition of Redgram varieties

Variety	Calculated on dry basis (g per 100 gms)						
	Moisture %	Protein %	Ash %	Fat %	Carbohydrate by difference %	Total sugars %	Reducing sugars %
CO 1	7.25	24.44	3.38	1.52	63.41	2.55	0.40
CO 2	9.62	22.72	4.05	1.59	62.02	1.64	0.40
CO 3	9.72	24.20	3.65	2.18	60.25	3.02	0.26
S 12	9.91	21.88	3.77	3.20	62.04	2.15	0.37
S 14	9.09	19.73	4.04	1.12	66.02	3.25	0.37
S 19	9.09	22.21	4.02	2.30	62.38	2.30	0.32

TABLE II. Cooking qualities of Redgram varieties

Variety	Cooking time (Minutes)		Cooked wt. (g per 100 g)	Cooked Volume (ml per 100 g)	Solids extracted in cooking water (g per 100 g)
	Open vessel	Pressure cooker			
CO 1	40	3	270	210	12.28
CO 2	60	4	256	220	10.11
CO 3	59	4	260	220	11.50
S 12	52.5	3	260	240	12.05
S 14	60.0	4	254	210	12.46
S 19	55.5	4	246	210	10.04

60 minutes. In pressure cooker at 15 psi all the varieties cooked in 3 to 4 minutes. There was not much difference among the varieties. The time needed to cook the various redgram varieties have been reported by Sankaran and Srinivasan (1963) and Rathinaswamy *et al.* (1973) to be 40 to 88 minutes and 25.1 to 38.0 minutes respectively. However, the cooking time of dhal is influenced by various factors such as the type of grain (whole or split), the quality of water used, temperature of cooking and the protein content of dhal. The

cooked volume of the varieties ranged between 210 and 240 ml. per 100 g and the cooked weight ranged between 246 and 270 g per 100 gm. Rathinaswamy *et al.* (1973) found that there was a significant negative correlation ($r = 0.93$) between the time taken for cooking and the protein content of the redgram varieties. No such significant negative correlation was observed in this study.

The percentage of solids in the cooked water of the dhal is one of the

TABLE III. Organoleptic panel evaluation scores of different varieties of Redgram Dhal

Variety	Cooked			Uncooked	
	Flavour	Colour	Taste	Colour	Appearance
CO 1	2.24	2.94	2.20	2.96	2.12
CO 2	2.24	1.56	2.20	1.72	2.72
CO 3	2.04	1.72	2.24	2.12	2.08
S 12	2.06	2.64	2.56	2.64	2.04
S 14	2.04	1.68	2.08	1.68	1.96
S 19	2.04	1.28	2.12	2.12	2.04

criteria in the South Indian dhal cookery. The dhal which shows the highest percentage of solid loss in the water extract is considered the best for making *rasam* (Rama Rao and Kadkol 1957). The percentage of solids lost in the water extract of redgram varieties ranged from 10.04 to 12.46, with S 14 showing the maximum loss and S 19 showing the minimum.

The organoleptic evaluation scores are presented in Table III. It was found that there were no significant differences in taste and flavour among the varieties. Among the cooked dhals CO 1 had better colour appeal than other varieties. The uncooked raw dhal was also evaluated for their colour and appearance. CO 1 scored first for colour while CO 2 scored highest for appearance. The new variety, CO 3, rated very low in colour in the cooked state.

The physical characteristics of the different varieties are given in Table IV.

TABLE IV. Physical Characteristic of Redgram varieties

Variety	100 seeds wt. (g)	Bulk density (g/ml)	Specific gravity
CO 1	7.38	0.83	1.35
CO 2	7.69	0.85	1.28
CO 3	7.03	0.87	1.38
S 12	7.86	0.87	1.28
S 14	7.76	0.85	1.33
S 19	7.36	0.87	1.35

The varieties did not show any significant difference in their physical characteristics such as seed weight, bulk density and specific gravity. Rathinaswamy *et al.* (1973) have observed differences in physical characteristics

among redgram varieties. The 100 seed weight ranged from 6.9 to 13.0 g in their study but in the present study the values ranged only between 7.03 to 7.69 g.

In conclusion, the newly developed variety, CO 3 had a higher content of protein which was equal to that of CO 1. Also, variety CO 1 performed better in cooking and organoleptic characteristics when compared to other varieties. Except for the poor colour registered by CO 3, it was found to be equal in taste and flavour with the already established varieties, CO 1 and CO 2.

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