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Effect of wormshaft speed and moisture content on oil and cake qualities of expelled sesame seed

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Abstract *For processing two sesame seed accessions, Yandev 55 and E8, in an oil expeller, a wormshaft speed of 45 rpm and 5.3% seed moisture content gave the best oil and cake qualities.*

Keywords: sesame, expeller, oil, wormshaft speed, moisture content.

Introduction

Sesame (Beniseed, *Sesamum indicum*) is an excellent source of oil and protein. It is free from antinutritional factors (Share 1998), unlike many oilseeds, and the oil contains the antioxidants sesamol and tocopherol which make it resistant to oxidative rancidity (Yen and Shyu 1989). The performance of oil expellers is affected by the operational parameters and seed moisture content (Sivakumaran and Goodrum 1987; Vadke and Sasulski 1988). However, there is little published information on the optimum conditions for sesame seed. This paper concerns the processing of two accessions, Yandev 55 and E8, commonly grown in Nigeria.

Materials and methods

Fifty kg of each accession were cleaned using a specific gravity separator to remove dust, sand, dry leaves and empty capsules. Samples were dehulled in a mechanical dehuller consisting of three blades rotating in a container of excess water (Olayanju et al. 2000). Seeds were separated from hulls in 15% brine, when the hulls sink while the seeds float. The moisture content was determined by drying at 105˚C for hand adjustment to 4.10, 5.31, 7.69 and 10.32% (Kachru et al. 1994). Dehulled samples (2 kg) were processed in an expeller with capacity of 10 kg/h, an expression chamber 60 mm in diameter and a wormshaft 600 mm long, powered by 0.75 kW reduction motor. The expressed oil was clarified in a filter press.

The specific gravity of the oil was determined using a density bottle, and the free fatty acid content by the AOAC (1984) method. The protein content of the cake was determined by the macro Kjeldahl method (AOAC 1984) and the residual oil by Soxhlet extraction with n-hexane. Three experiments were conducted using four wormshaft speeds as main plot with moisture content as subplot and accession as the sub-subplot.

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Results and discussion

The colour of the oil darkened as the wormshaft speed increased from 30 to 75 rpm and with higher initial moisture content (Table 1). All the oil colours were within the standard for crude oils (Rosell and Pritchard 1991). The residual oil in the cake increased with higher moisture contents. The lowest residual oil was obtained at 45 rpm and moisture content of 5.3% for both accessions. Similar trends were reported by Tikko et al. (1985) for a different expeller and by Sivakumaran and Goodrum (1987) for a screw press.

The relative density of the expressed oil was 0.915–0.923, within the range specified for sesame seed oil by the Codex Alimentarius (1992) and the free fatty acid values (0.84 and 0.98) were below the level of 1.01% specified by Johnson et al. (1979).

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Table 1. Effect of wormshaft speed and moisture content of two sesame seed accessions

Wormshaft Speed (rpm)	Moisture content (%, wb)	Residual oil in cake (%)		Residual moisture in cake (%)		Colour of oil	
		Yandev 55	E8	Yandev 55	E8	Yandev 55	E8
30	4.10	40.4	42.8	3.30	3.52	Light	Light
30	5.31	37.3	36.1	4.60	4.64	Light	Yellow
30	7.69	37.9	37.6	6.05	6.25	Yellow	Yellow
30	10.32	42.2	42.3	6.22	7.09	Light	Light
45	4.10	20.0	23.6	3.20	3.39	Light	Light
45	5.31	14.4	17.7	4.60	4.60	Golden	Golden
45	7.69	22.7	25.6	6.16	6.18	Golden	Golden
45	10.32	27.1	27.1	6.44	6.52	Yellow	Light
60	4.10	32.2	32.8	3.20	3.38	Light	Light
60	5.31	29.7	31.1	4.65	4.68	Golden	Golden
60	7.69	36.8	37.0	6.18	6.21	Golden	Light
60	10.32	37.0	39.4	6.68	6.59	Light	Golden
75	4.10	38.8	39.6	3.30	3.55	Light	Light
75	5.31	38.0	38.5	3.30	3.57	Light	Light
75	7.69	43.3	43.5	6.16	6.19	Light	Yellow
75	10.32	43.5	43.9	6.70	6.73	Yellow	Yellow

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